



USAID
FROM THE AMERICAN PEOPLE

ENERGY UTILITY PARTNERSHIP PROGRAM (EUPP) FINAL REPORT

September 30, 2007 to September 30, 2018

Submission Date: December 30, 2018

Cooperative Agreement Award Number: EPP-A-00-07-00008
Activity Start Date and End Date: September 30, 2007 to September 30, 2018
[COR/AOR] Name: Kristen Madler

Submitted by: Marjorie Jean-Pierre, Program Director
United States Energy Association
1300 Pennsylvania Avenue, NW, Suite 550, Mailbox 142
Tel: (202) 312-1248
Email: mjean-pierre@usea.org



This document was produced for review by the United States Agency for International Development.

FINAL REPORT

ENERGY UTILITY PARTNERSHIP PROGRAM (EUPP)

Cooperative Agreement No. EPP-A-00-07-00008

DISCLAIMER The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States government.

TABLE OF CONTENTS

- ACRONYMS iv
- EXECUTIVE SUMMARY I
 - Background/Problem Statment..... I
 - USEA’s History Of Partnership Development..... 3
 - Brief Description Of EUPP Cooperative Agreement..... 4
 - Summary Of Program Objectives..... 4
 - Brief Review Of Program Accomplishments..... 5
- I. OVERVIEW OF ACTIVITIES BY COUNTRY 7
 - I.1 Task 1: Establish And Implement 7 New Energy Utility Partnerships..... 8
 - I.2 Task 2: Establish And Implement The Utility Attachment Program56
 - I.3 Task 3: Arrange For One Partnership Impact Assessment56
 - I.4 Task 4: Information Dissemination and Non-Partnership Workshops And Conference Support57
- 2. RESULTS, SUB-RESULTS, AND TARGETS FOR ALL INDICATORS BY COUNTRY..... 64
 - 2.1 Impacts and Indicators64
- 3. KEY ACCOMPLISHMENTS AND SUCCESSES..... 68
 - 3.1 Promoting U.S. Expertise In Developing Markets.....68
 - 3.2 Expanding Regional And Global Cooperation69
 - 3.3 Building An Enabling Environment For U.S. Developers71
 - 3.4 Improving Reliability Through System Planning And Operations.....72
 - 3.5 Increasing Staff Capability To Improve Operations And Decrease Need For Future Assistance76
 - 3.6 Restructuring And Governance79
- 4. LESSONS LEARNED 81
- 5. SUMMARY OF PRODUCTS, PRESENTATIONS, AND PUBLICATIONS 85
 - 5.1 Selected Publications, Presentations, and Publications85

ANNEXES

The following Annexes are provided as supplemental information to this final EUPP report.

Annex A: Selected Activity Agendas

- Agenda-Engendering Utilities-Germany-2016
- Agenda-Exec Exchange-KenGen-NZ Exchange-Kenya – December 2017
- Agenda-GTG India Forecasting vRE Bootcamp-India-July 2016
- Agenda-Haiti Loss Reduction-dual language-Haiti- March 2017
- Agenda-ODDEG Drilling Training-Djibouti- December 2017
- Agenda-Tanzania 2014 Conference Agenda-Tanzania- September 2014

Annex B: JUPP Final Report (2009 – 2012)

Annex C: Impacts and Indicator Tables for Entire Period of Performance

Annex D: Selected Publications

- Kenya Geothermal Development Company Data Management Assessment
- South Asia Regional Initiative for Energy Integration (SARI/EI) Report on “Linking South Asia with Burma & Southeast Asia to Advance Cross Border Electricity Trade: A Political Economy Study”
- EKT Wheeling Report, “Tariff Calculation of the Ethiopia – Kenya – Tanzania Transaction”
- John Beardsworth Report on “Improving Power Purchase and Fuel Supply Agreements”
- Ethiopia Law Report
- Haiti “Final Report on Capacity Building Workshop Series for the Haitian Regulatory Agency”

ACRONYMS

LIST OF ACRONYMS	
ACEF	Asia Clean Energy Forum
AEDB	Alternative Energy Development Board
ANARSE	l'Autorité Nationale de Régulation du Secteur de l'Energie
APS	Arizona Public Service
ARGeo	African Rift Geothermal Conference
AUC	African Union Commission
BEDAS	Enerjisa Başkent Elektrik Dağıtım
BERC	Bangladesh Energy Regulatory Commission
BPDB	Bangladesh Power Development Board
CAD	Computer-aided Design
CAISO	California Independent System Operator
CAPP	Central Africa Power Pool
CAPUC	California Public Utility Commission
CBET	Cross-border Energy Trade
CCEE	Camara de Comercializacao de Energia Eletrica
CDER	National Agency for Renewable Energy, Morocco
CEO	Chief Executive Officer
CERC	Clean Energy Resource Center
CERD	Centre d 'Etudes et de Recherché de Djibouti
COELBA	Companhia de Eletricidade do Estado da Bahia, Brazil
CPPA-G	Central Power Purchasing Authority Guarantee Limited
CPR	Cardiopulmonary Resuscitation
CT	Current Transformers
CTOTF	Combustion Turbine Operations Technical Forum
DABS	Da Afghanistan Breshna Sherkat
D.C.	District of Columbia
DCS	Distributed Control System
DGNREEC	Directorate General, New Renewable Energy and Energy Conservation, Indonesia
DHPS	Department of Hydropower & Power Systems , Bhutan
DOE	U.S. Department of Energy
DNP	Distributed Network Protocol
DRC	Democratic Republic of the Congo
DSM	Demand Side Management
EAGP	East Africa Geothermal Partnership
EAPP	Eastern Africa Power Pool
EATP	Eastern Africa Transmission Planning Partnership
EC-LEDS	Enhancing Capacity for Low Emission Development Strategies
EDC	Electricity Distribution Company
EEA	Ethiopian Energy Authority
EEU	Ethiopian Electric Utility

EGAT	Bureau for Economic Growth, Agriculture and Trade, USAID
EKT	Ethiopia-Kenya-Tanzania
Eoi	Expression of Interest
EMRA	Energy Market Regulatory Authority, Turkey
ERCOT	Electric Reliability Council of Texas
ERP	Enterprise Resource Planning
ESMAP	Energy Sector Management Assistance Program
EUCL	Energy Utility Corporation Limited, Rwanda
EUPP I	Energy Utility Partnership Program I
EWURA	Energy and Water Regulatory Authority, Tanzania
GEA	Geothermal Energy Association
GCC	Global Climate Change
GDC	Kenya's Geothermal Development Company
GGDP	Global Geothermal Development Plan
GIS	Geographic Information System
GoE	Government of Ethiopia
GoK	Government of Kenya
GRC	Geothermal Resources Council
GRMF	Geothermal Risk Mitigation Facility
GSE	Geological Survey of Ethiopia
GTG	Greening the Grid
HECO	Hawaii Electric Company
HEPP	Haiti Energy Policy & Utility Partnership
HMI	Human Machine Interface
HNEI	Hawaii Natural Energy Institute
I&E	Office of Infrastructure and Energy, USAID
IBN	Investment Board Nepal
IDECO	Irbid District Electricity Company, Jordan
IEC	International Electrotechnical Committee
IFE	International Faculty of Energy
IHE	Haitian Institute for Energy
IO	Input/Output
IRENA	International Renewable Energy Agency
IRRP	Integrated Resource and Resilience Planning
JDA	Joint Development Agreement
JEPCO	The Jordanian Electric Power Company
JTUP	Jordan Transmission Utility Partnership
KEC	Kingdom Electricity Company, Jordan
KenGen	Kenya Electricity Generating Company PLC
Kenya Power	Kenya Power & Lighting Company
KETRACO	Kenya Transmission Operations
KIUC	Kauai Island Utility Cooperative
KOP	Key Operational Plan
KPIs	Key Performance Indicators
LBNL	Lawrence Berkley National Labs
LEDS	Low Emission Development Strategies
LEI	London Economics International
MEMR	Ministry of Energy and Mineral Resources

MERN	Ministry of Energy and Natural Resources
METI	Indonesian Renewable Energy Society
MEW	Ministry of Energy & Water, Afghanistan
MHP	Micro-hydro Projects
MISO	Midwest System Operator
MoEA	Ministry of External Affairs, Bhutan
MoE-PD	Ministry of Energy (Power Division)
MoF	Ministry of Finance, Tanzania
MOU	Memorandum of Understanding
MoWIE	Ministry of Water, Irrigation, and Energy, Ethiopia
MPA	Meralco Power Academy, Philippines
MV	Medium Voltage
NAPTIN	National Power Trading Institute Of Nigeria
NEM	National Energy Market, Australia
NEA	Nepal Electricity Authority
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NEPS	North East Power System
NGCP	National Grid Corporation of the Philippines
NGOs	Non-Governmental Organizations
NPTI	National Power Training Institute
NREL	National Renewable Energy Laboratory
NTC	Network Transfer Capacities
NTDC	National Transmission and Dispatch Company
O&M	Operation and Maintenance
OTC	Offshore Technology Conference
PDOE	Philippine Department of Energy
PFC	Power Finance Corporation of India
PFS	PTC Financial Services Ltd.
PG&E	Pacific Gas and Electric
PGCB	Power Grid Company of Bangladesh
PIB	Petroleum Industry Bill
PLN	Perusahaan Listrik Negara, Indonesia
POSOCO	Power System Operation Corporation Limited, India
POWERGRID	Power Grid Corporation of India Limited
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PT	Potential Transformers
PTC	Power Trading Corporation, India
PSS/E	Power System Simulator for Engineers
RLDC	Regional Load Dispatch Center
RPA	Reverse Power Auction
SAARC	South Asian Association for Regional Cooperation
SADC	Southern African Development Community
SAPP	Southern Africa Power Pool
SARI/EI	South Asia Regional Initiative for Energy Integration
SIEPAC	Sistema de Interconexión Eléctrica de los Países de América Central
SLDC	State Load Dispatch Center
SMUD	Sacramento Municipal Utility District

SPS	Special Protection Systems
SSA	Steam Supply Agreements
STEM	Science, Technology, Energy, Mathematics
TANESCO	Tanzania Electric Supply Company Ltd
TATA	Tata Power Delhi Distribution Limited
TNB	Tenaga Nasional Berhad, Malaysia
ToT	Train-the-Trainer
TPDC	Tanzania Petroleum Development Corporation
TRA	Tanzania Revenue Authority
U.S.	United States
USAID	United States Agency for International Development
USEA	United States Energy Association
WGC	World Geothermal Congress
WIREC	Washington International Renewable Energy Conference
ZECO	Zanzibar Electricity Corporation

EXECUTIVE SUMMARY

BACKGROUND/PROBLEM STATEMENT

In the developing world, lack of access to energy remains a critical barrier to development. Numerous studies have documented the decisive relationship between the provision of energy services and global social, economic, and political development.

There is clear recognition that the energy sectors of many United States Agency for International Development (USAID)-assisted countries have not been able to keep pace with the needs of society and those countries continue to experience chronic problems of shortage of supply and poor quality of service. Inefficiencies in utility management in generation, transmission, and distribution use of energy persist. The utilities struggle with antiquated equipment and inadequate system management. For example, on average, developing country utilities (the vast majority of which are state-owned) currently require over 30 percent more fuel input than developed nations' utilities to produce the same amount of electric power. Consequently, developing country economies require 40 percent more energy than developed nations to produce the same value of goods and services.

It is necessary to meet our basic needs: to grow and cook our food, to light our homes, to power our machines and technologies. Access to energy is a key requirement for the agricultural sector, commerce and industries. It is also important for the provision of public services, such as education and health care. A lack of access to modern energy services affects health negatively, limits opportunities, and widens the gap between the rich and the poor. A lack of access to modern energy services limits economic opportunities and widens the gap between the rich and the poor. Poor people are often cut off from valuable information and efficient production technologies. Not having reliable access to modern energy often means spending a lot of time, money and effort on securing energy supply for basic needs.

- About 1.1 billion people do not have access to electricity, according to the IEA 2017 Energy Access Outlook.
- Around 84% of those without electricity access reside in rural areas of developing countries; those who have access to electricity often face very high prices for supply that is insufficient and unreliable.
- More than 95% of those living without electricity are in countries in sub-Saharan Africa and developing Asia.
- More than 2.8 billion people – 38% of the world's population – lack access to clean cooking, typically using inefficient stoves or open fires in poorly ventilated spaces.
- In 25 countries, mostly in sub-Saharan Africa, more than 90% of households rely on wood, charcoal and waste for cooking.
- There is a significant health risk to people who use biomass for cooking or heating. According to the World Health Organization (WHO, 2018), 3.8 million people a year die prematurely from illness attributable to the household air pollution caused by the inefficient use of solid fuels and kerosene for cooking.

Private and public gas and electric utilities and other energy service providers that generate, transmit, and distribute power have been seriously handicapped by:

- Inefficient and constraining institutional/organizational structures;
- Severe environmental pollution problems;
- Inefficient use of power and inadequate emphasis on energy conservation;
- Low management and labor productivity;
- Uneconomic power tariffs;
- Lack of financial resources for maintenance and system expansion;
- Inefficient power plants; and
- Substantial technical and non-technical distribution and transmission losses.

However, world energy consumption is expected to grow by 28 percent between 2015 and 2040, with the majority of growth in energy demand to occur in developing countries. Electricity demand has increased at a higher rate than supply in most developing countries, leading to shortages of more than 18 percent in peak power demand and between 8 and 10 percent in non-peak demand. Although industrial users are most severely impacted, commercial, agricultural, municipal, and residential users have had to curtail productive activities due to power sector problems.

We often hear that the energy sector is on the brink of transformation, but most utility leaders will tell you that the transformation has already begun. To advance, utilities must be able to not only handle the day-to-day operations of their utility but expertly address a host of new issues. The sector is being reshaped by the shift in generation sources away from traditional sources and rapid expansion of generation and grid networks to increase electricity access.

Energy sector leaders are also tasked with finding sustainable approaches that meet the needs of the present without compromising the ability of future generations to meet their own energy, environmental, and economic development needs. Climate risk, other environmental challenges such as clean air and water, and energy security have emerged as key global challenges of the 21st century. Therefore, policies and programs facilitating large-scale adoption and deployment of clean and renewable energy, energy trade and greater resource efficiency will need to play a more central role in economic development.

USAID established the Energy Utility Partnership Program (EUPP) to provide practitioner-to-practitioner, multi-year partnerships between the United States (U.S.) and USAID-assisted country energy ministries, energy agencies, utilities, and regulatory agencies. EUPP promoted the more efficient, sustainable and environmentally sound supply and use of energy through the transfer of market-based approaches and "best practices" for energy system operation and regulation to increase sustainable modern energy services and clean energy production in USAID-assisted countries. EUPP volunteer-driven partnerships mobilized overseas utilities to better address energy service priorities, while improving productivity and quality of service. In addition, the creation of these partnerships helped to ensure domestic consistency in the provision of foreign assistance.

Typical challenges addressed through the partnerships established under EUPP included but were not limited to:

Environmental Challenges:	Operational Challenges:	Administrative Challenges
SOx emissions	Dispatching renewables	Accounting & financial management
Water quality	Reliability of network	Computerization & modernization

Particulates from diesel generators	Reducing outages	Consumer & stakeholder interactions
NOx emissions	System planning	Decision-making processes
Deforestation for fuel	Integrating renewables	Corporate restructuring
Tariff Challenges:	International energy trading	Customer service
Gas pricing	Demand side management (DSM)	Commercialization
Energy pricing	Forecasting	Management & human resources
Transmission tariffs	Asset management	Institutional development
Wheeling charges	Safety of personnel	Quality of service
Cross subsidies		Sector restructuring
		Gender & racial inclusion

Through USEA’s unique collaborative utility partnership model for sustainable change and our dynamic network of knowledge and information services that provide a strong foundation for programmatic endeavors, EUPP continues to thrive. The success of EUPP is a direct result of the extraordinary commitment and expertise of participating partner institutions, sector experts, and volunteers. EUPP has aided USAID-assisted countries in moving beyond the trial and error approach that has been utilized by most of the world and to swiftly embrace 21st century practices. This increases the likelihood that the positive economic and social impacts on the lives of the world’s most vulnerable citizens can be realized more quickly.

USEA’s HISTORY OF PARTNERSHIP DEVELOPMENT

USEA is an association of public and private energy-related organizations, corporations, and government agencies. USEA represents the broad interests of the U.S. energy sector by increasing the understanding of energy issues, both domestically and internationally. Our mission is "to promote the sustainable supply and use of energy for the greatest benefit of all."

Since 1991, with funding from and in close collaboration with USAID and the U.S. energy industry, USEA has established over 80 one-on-one voluntary energy utility partnerships in over 25 USAID-assisted countries. These partnerships continue to provide a vehicle to convey U.S. experiences and best business and regulatory practices to these nations. USEA's energy partnerships have been applauded as some of the most successful foreign assistance programs ever created. Partnerships have been established between the U.S. and Latin America, Africa, Asia, and Central & Eastern Europe. Focus areas have included electric power production, transmission, distribution, and utilization; petroleum exploration, production and transportation; and natural gas exploration, production, and transportation. Additionally, almost every aspect of organizational operations has been addressed through these partnerships. These partnerships continue to:

- Promote energy security;
- Open doors for private sector investment and sales of equipment and services;
- Build enabling business and regulatory environments for U.S. developers;
- Utilize private sector executives to drive partnerships forward;
- Enhance and expand regional cooperation in conflict areas;
- Leverage public and private investments;
- Promote cross-border electricity trade;
- Promote U.S. expertise in USAID-assisted markets;

- Bridge gender gaps in the energy sector;
- Provide rapid response mechanisms to critical power sector challenges;
- Build key relationships;
- Reflect evolving geopolitical realities;
- Build a domestic constituency for USAID;
- Have crucial and immediate impact; and
- Build regulatory frameworks.

USEA is proud of our work with USAID on this partnership and the impact that it continues to have on the global energy sector.

BRIEF DESCRIPTION OF EUPP COOPERATIVE AGREEMENT

Based on USEA's history of working in collaboration with USAID on partnership building initiatives, on September 30, 2007, the USAID selected USEA as its implementing partner for Cooperative Agreement Award Number EPP-A-00-07-00008-00 for USAID's EUPP. EUPP was originally funded in the amount of \$2,495,210 for a period of three years. This initial period was extended through September 2018 for a total of 11 years with total funding of \$29,062,520. EUPP was implemented by USEA on behalf of USAID's Bureau for Economic Growth, Agriculture and Trade (EGAT), Office of Infrastructure and Energy (I&E) and several USAID missions that bought into the cooperative agreement. This report summarizes activities completed under EUPP.

EUPP was established to help USAID-assisted countries to increase environmentally sustainable energy production and use and to improve the operational efficiency and increased financial viability of their utilities and related institutions.

EUPP assisted the EGAT/I&E/Energy with the goal of increasing access in USAID-assisted countries to environmentally sound energy services by:

- Improving policy and legal frameworks to establish necessary market conditions for the private sector delivery of energy services and environmental management services;
- Increasing institutional ability to provide or deliver energy and environmental management services in the new and enhanced markets;
- Increasing understanding of, and participation in, decisions regarding energy delivery and environmental management services; and
- Transferring best practices and allowing developing country utilities to benchmark themselves against world standards.

SUMMARY OF PROGRAM OBJECTIVES

EUPP's overarching objective was to strengthen the capacity of utility executives and employees in USAID-assisted countries to effectively manage and operate power systems, run financially viable businesses, and integrate different types of energy resources into their power grids. With the end goal being an increase in safe, affordable, and reliable energy access for the world's most vulnerable citizens.

Through the establishment of partnerships between the U.S. and USAID-assisted energy service

providers, EUPP outlined areas of interest to help achieve the provision of modern energy services and to improve energy sector governance, including:

- Aiding the organization and structuring of markets;
- Improving system planning and operations to improve reliability and access;
- Increasing the capacity of management to operate a utility along commercial lines; and
- Expanding access to reliable and modern forms of energy by consumers in USAID-assisted countries.

BRIEF REVIEW OF PROGRAM ACCOMPLISHMENTS

The number of people gaining access to electricity has been accelerating since 2010 by around 118 million each year, but these efforts will need to accelerate if the world is going to ensure access to affordable, reliable, sustainable and modern energy for all.

To help ensure increased, environmentally sustainable energy production and use in USAID-assisted countries and meaningful impact for global citizens, work under the EUPP was directly responsible for the following specific outcomes and results:

- The transformation of USAID-assisted country energy service providers into more autonomous, commercially viable entities through the transfer of private sector, market-oriented approaches that improve planning, management, financing, operations, and environmental performance;
- An increase in the number of USAID-assisted country energy personnel trained in improved energy policy, regulation, technology, and business management practices;
- An increase in the impact of USAID funding through the leveraging of additional in-kind contributions for energy infrastructure improvement of a value at least equal to the funding provided by USAID;
- The transfer of “best practices” from the United States, or other relevant countries to USAID-assisted countries;
- An improvement in the conditions for energy markets to operate;
- An increase in public understanding of, and participation in, decisions regarding delivery of energy services; and
- The transfer of U.S. documents, software, manuals, and other materials to improve utility and energy supply operations in USAID-assisted countries.

These outcomes and results were accomplished through:

- The establishment or continuation of 19 country-specific energy utility partnerships;
- The establishment of eight new regional/global energy partnerships/programs;
- The facilitation of five energy focused global workshops;
- The facilitation of seven energy focused regional workshops;
- Support provided to Washington International Renewable Energy Conference (WIREC);
- Sponsorships provided for delegates to attend relevant workshops and conferences;
- The leveraging of millions of dollars; and

- The dissemination of materials aimed to improve utility and energy supply operations in USAID-assisted countries.

The partnerships, workshops, and conferences developed and facilitated under the EUPP addressed efficiency and energy access, including renewable energy sources in some manner.

In the following section we provide an overview of EUPP activities and the benefits of those activities.

I. OVERVIEW OF ACTIVITIES BY COUNTRY

One of the most exciting advancements in the changing landscape of international development in recent years is the evolution of the relationship between private enterprise and the international development community. Leaders in both sectors are figuring out how to leverage one another's unique capabilities and apply them collaboratively to challenges that otherwise neither could take on alone.

For years, many saw donors like USAID, non-governmental organizations (NGOs) and governments as the primary, if not the only drivers, of progress. Donations were welcomed and there was some effort to contract with the private sector, but seldom was business seen as a true driver of development. Today, that's all changed.

Through EUPP, USEA and USAID committed to working with leaders and practitioners from across sectors to push this enterprise-driven change forward, so that the value of private-sector engagement and of reaching beyond traditional contracting and grant-making models—to collaborate, co-finance, and co-design programs, tools, and initiatives - was recognized. This type of approach is crucial to ensuring energy access and reliability of services. Under EUPP one end goal of the partnerships and the training that took place through them was to reduce power outages by making the utilities more efficient and profitable. This type of reliability results in very consequential outcomes including but not limited to:

- The provision of reliable power to medical facilities so that vaccines do not get ruined and operations do not get interrupted;
- Working street lights in rural villages that act as a deterrent to crimes, including rape; and
- Increase the opportunities for children to read and study after dark without the expense and health hazards that are associated with burning candles, wood, and animal dung indoors.

In addition to the very real impacts that increasing energy access has on the lives of the people, electricity and natural gas are essential to building strong local economies. When energy is attainable, abundant, reliable, and clean, sectors such as manufacturing, agriculture, tourism, and many others thrive.

The enterprise-driven development that was fostered through EUPP was all about finding market-based models, and pursuing new ways to collaborate and achieve development objectives that are more sustainable in the long term, because they also help to achieve the business objectives of USAID's private sector partners. This type of approach helps to foster the reasons why development work is undertaken: to build a safer, freer, more peaceful and prosperous world, true to our democratic values.

EUPP embraced the creativity and entrepreneurship that the private sector brings and the notion that involving the private sector will help achieve sustained impact and support the goal of ending the need for foreign assistance.

The enterprise-driven development undertaken through EUPP provided the opportunity to: engage new partners; connect support on transparent, competitive bidding with reduced

corruption; decrease energy prices; increase energy security; and increase competitiveness and new market opportunities for U.S. companies. Partnerships and the benefits they provide lie at the heart of enterprise-driven development. It is through this collaborative model that EUPP was born.

USEA and its members continue to lead the effort to improve energy infrastructure and energy services in developing countries through our unique international energy partnerships and workshops. Utilities and energy service providers have volunteered their time and expertise in over 80 partnerships with their overseas counterparts to transfer best utility and energy practices. From executive exchange visits on energy efficiency and distribution system operations to workshops on grid-connected renewables and transmission system protection strategies, this program continues its legacy as one of America's most successful volunteer-based international energy assistance programs ever. The knowledge transfer that is inherent throughout EUPP is essential to creating a world in which everyone has access to clean, reliable, and affordable energy.

Under EUPP's Cooperative Agreement, USEA was tasked with providing results in five specific task areas directly related to enterprise-driven development through private sector partnership development.

The Task areas along with resulting accomplishments are outlined below.

I.1 TASK: ESTABLISH AND IMPLEMENT 7 NEW ENERGY UTILITY PARTNERSHIPS

The cornerstone of USEA's successful implementation of EUPP was the willingness of experts from the U.S. and other developed energy sectors to volunteer their time and expertise to the partnership activities. In developing these partnerships USEA was tasked with:

- Selecting USAID-assisted country partners in collaboration with USAID;
- Setting up partnerships;
- Assisting in the preparation of Work Plans for the partnerships;
- Arranging for partnership Signing Ceremonies, as appropriate;
- Arranging logistics and travel for the partnership executive exchanges; and
- Accompanying senior executives on executive exchanges, as necessary, to assure continuing attention to the key issues identified in the Work Plan and to maintain partners focus on results-oriented actions.

I.1.1 TASK 1: RESULTS – PARTNERSHIP DEVELOPMENT

The partnerships and programs formed or continued under EUPP supported energy sector reform and the integration of modern energy sources as critical mechanisms which promoted accelerating a partner country's path to self-reliance. Under EUPP, USEA met and exceeded the goal of establishing seven partnerships by facilitating the formation of 19 country specific partnerships and eight regional partnerships. The country specific partnerships established included:

- Afghan Utility Partnership;
- Bangladesh Utility Partnership;

- Central African Power Pool;
- Democratic Republic of the Congo (DRC) Hydro Partnership;
- Ethiopia Utility (Distribution) Partnership;
- Ghana Utility Partnership;
- Greening the Grid (GTG) System Operators Partnership (India);
- Haiti Energy Policy & Utility Partnership (HEPP);
- Jordan Distribution Utility Partnership (JDUP);
- Jordan Transmission Utility Partnership (JTUP);
- Kenya Transmission Operations (KETRACO) Partnership;
- Kenya Wind Partnership;
- National Power Trading Institute Of Nigeria (NAPTIN) Partnership;
- Nile Equatorial Lakes Subsidiary Action Program (NELSAP) Partnership;
- PT PLN Persero (PLN) – Hawaii Electric Company (HECO) Partnership;
- Pakistan Utility Partnership;
- Rwanda Energy Partnership;
- Senegal Energy Partnership; and
- Tanzania Capacity Building Partnership.

The regional/global partnerships established under EUPP included:

- Afghanistan/Central Asia Transmission Partnership;
- East Africa Geothermal Program (EAGP);
- Eastern Africa Regional Transmission Planning Program (EATP);
- Engendering Utilities Partnership;
- Global Climate Change (GCC) Regional Partnership;
- South And Central Asia Best Practices Partnership;
- South Asia Regional Initiative For Energy Integration (SARI/EI) Partnership; and
- Southern Africa Power Pool (SAPP) Partnership.

Summaries of the partnership topics and activities that were conducted under each partnership are included below. Key accomplishments and successes of EUPP are included in Section 3 of this report.

AFGHANISTAN UTILITY PARTNERSHIP:

In 2012 USEA launched a U.S.-Afghanistan Utility Partnership for Da Afghanistan Breshna Sherkhata (DABS), Afghanistan’s national government utility, in cooperation with USAID’s Afghanistan Mission and USAID/EGAT. The objective of the U.S.-Afghanistan Utility Partnership was to share utility best practices in power generation, transmission, distribution, and energy markets with DABS. The partnership introduced best practices in the following areas:

- Power generation (non-renewables);
- Transmission systems;
- Distribution systems;
- Electric market operations;
- Electricity regulation, policy and finance;
- Asset management;
- Renewable energy grid integration;

- Power purchase agreements (PPAs) with utility-scale grid connected renewables, solar or wind/diesel hybrid systems; and
- Ministry-level policy practices promoting renewables and private sector involvement.

The following activities took place under this partnership:

June 22-29, 2013, New Delhi and Kolkata, India - Executive Exchange on Commercial Operations & Customer Service for Afghanistan's Power Sector: The first activity under this partnership with ten executives from DABS; the purpose of the executive exchange was for load center directors and commercial officers to gain exposure to best practices in the distribution utility commercial management process, distribution system customer service process, and managing load shedding.

November 10-20, 2013, United States - Executive Exchange for Afghanistan's Power Sector to the US: The executive exchange focused on the full spectrum of the U.S. power sector. The exchange was conducted in Washington, DC, Annapolis and Baltimore, Maryland. The delegation held meetings with their counterparts to review U.S. best practices in power generation, transmission and distribution systems, electricity market operations, and regulation and finance. USAID organized this exchange to support the continued development of the electric power sector of Afghanistan by sharing best practices and experiences with energy leaders in the U.S.

January 27-30, 2014, Kuala Lumpur, Malaysia – Benchmarking Technical Visit on Asset Management: In an executive exchange, fourteen delegates from Afghanistan's electric utility, DABS, learned best practices in asset management from Tenaga Nasional Berhad (TNB), Malaysia's electric utility. Asset management for electric utilities refers to the optimal lifecycle management of physical assets, such as transformers and cables, to sustainably achieve the stated business objectives. The training at TNB's Integrated Learning Solution facility (ILSAS) aimed to improve the profitability, efficiency and safety of DABS' operations through the transfer of industry best practices. Through a combination of presentations and site visits, TNB's training program covered generation, transmission and distribution asset management at the corporate and division levels.

August 11-14, 2014, Ankara, Turkey - Executive Exchange on Enterprise Resource Planning: Energy executives representing DABS participated in executive exchange; the DAB's 10 member delegation met with their counterparts from the Turkish Electricity Distribution Company, Enerjisa Başkent Elektrik Dağıtım (BEDAS) and the Republic of Turkey Energy Market Regulatory Authority (EMRA). During the exchange, the delegation examined best practices of the distribution utility enterprise resource planning (ERP) process, including ERP procurement, implementation and optimization, along with best practices of distribution utility training management, including training program governance, evaluation, certification procedures and health and occupation safety training

November 10-14, 2014, India - Executive Exchange on Clean Energy Integration for Afghanistan's Power Sector: The exchange was conducted for 10 executives from DABS and the Ministry. The primary objectives of this executive exchange were for officials to gain exposure to the renewable energy integration process, including issues and challenges facing renewable energy technologies used in the power sector, utility best practices in interconnection of intermittent resources, and best practices in distributed generation, and as

well as understand best practices in the promotion of renewable energy, including policy, incentive and regulatory best practices for encouraging renewable energy, reverse auction mechanism and PPA best practices, and best practices in renewable energy project development and financing.

April 10-17, 2015, Indonesia – Executive Exchange on Clean Energy Integration For Afghanistan’s Power Sector: Senior officials from DABS and the Ministry of Energy & Water (MEW) participated in an executive exchange with their counterparts in Jakarta, Indonesia to review best practices in the renewable energy integration process. During the exchange, the delegation gained exposure to renewable energy integration process. The 10-member Afghan delegation met with key institutions involved in the Indonesian clean energy sector, including the Directorate General, New Renewable Energy and Energy Conservation (DGNREEC); the Indonesian Renewable Energy Society (METI); ASEAN Centre for Energy; and PLN.

September 5-12, 2015, Madrid & Seville, Spain – Executive Exchange on Clean Energy Integration for Afghanistan’s Power Sector: USEA organized an executive exchange in Seville and Madrid, Spain for Senior Afghan officials from the MEW and DABS, the national utility who met with their Spanish counterparts to discuss integrating renewable energy into the grid.

November 2015, New Delhi, India - Executive Exchange on Clean Energy Integration for Afghanistan’s Power Sector: Senior officials from DABS and MEW participated in an executive exchange with their counterparts in New Delhi, India to review best practices in the renewable energy integration process.

May 1-5, 2017, India - Executive Exchange on Regulation of India’s Electricity Industry: Seven delegates from Afghanistan’s MEW and DABS participated in a five-day executive exchange to expand their knowledge on electricity regulation best practices to support establishing a national electricity regulator in Afghanistan. The delegation engaged in discussion with India’s national electricity regulator, state regulators, and electricity utilities.

BANGLADESH UTILITY PARTNERSHIP:

The U.S. - Bangladesh Power Generation Partnership was developed between selected global electric utility and energy companies and the Bangladesh Power Development Board (BPDB) to promote best practices in efficiency, operation, and maintenance. This program is intended to further build the capacity of Bangladesh’s senior level managers and plant operators by providing them the opportunity to work with and learn best utility operation and maintenance practices for power generating plants directly from their peers at selected U.S. and global electric utilities. The expected results are the introduction and adaptation of proven utility operating and maintenance best practices, policies, training, and tools into the Bangladesh power sector which will result in helping to create economic and social opportunities for its citizens.

The partnership was designed to:

- Introduce commercially-proven approaches to improve the operations and maintenance of power plants;
- Transfer “best practices” and performance standards utilized around the world to different equipment and areas of power plants;
- Improve efficiency practices and upgrades;
- Improve reliability initiatives;

- Expose officials to strategic decision-making processes for long-term planning of equipment replacement and upgrades; and
- Improve performance of environmental pollution and emission control equipment.

Activities under this partnership included:

August 13-17, 2011, Dhaka, Bangladesh - Definitional Visit to Discuss the Partnership with BPDB: USEA's John Hammond (Program Manager) and Matthew Gebert (Senior Program Coordinator) traveled to Dhaka in August 2011 to attend meetings and site visits related to the operation and maintenance of gas-fired power plants in Bangladesh. After additional meetings with the U.S. Agency for International Development's energy team in Dhaka, World Bank officials in Dhaka, and visiting BPDB's Ghorashal Power Station outside Dhaka, USEA and BPDB signed a Memorandum of Understanding (MOU) establishing an International Utility Partnership Program designed to expose BPDB to best practices in the operation and maintenance of their power generation fleet.

November 14-18, 2011, Turkey – Executive Exchange Visit to Turkey by BPDB: Senior executives and plant managers from the BPDB and its affiliates and the Bangladesh Ministry of Power, Energy and Mineral Resources studied best practices in the operation and maintenance (O&M) of power plants in Turkey.

April 16-24, 2012, United States- Executive Exchange Visit to Combustion Turbine Operations Technical Forum (CTOTF), GE Energy, TVA, Constellation Energy, Georgia Power: Five executives and power plant managers from the BPDB gained exposure to advanced strategies and techniques to improve the operation and maintenance of gas-fired power plants by meeting with leading utilities and equipment manufacturers in the United States.



Figure 1 Bangladesh Power Development Board members outside GE's turbine manufacturing plant in Greenville, SC

November 4-15, 2013, United States – Training Course on GE's Mark Vie Software: Over the course of two weeks, delegates received technical training on Plant System Architecture, Network Topology, Redundancy, Human Machine Interface (HMI)/Controller, Configuration and Turbine Integration as part of the Plant Control System, Introduction to ControlST including ToolboxST and WorkstationST, Hardware Configuration in ToolboxST and Troubleshooting, Distributed Control System (DCS) Hardware Drawings and Panel Design, including Input/Output (IO) Configuration, Power Distribution and Redundancy, Software Configuration in ToolboxST - DCS Library, Creating, Modifying and Troubleshooting Software, HMI and

External Device Configuration in WorkstationST - Network Time Synchronization, Alarms, Alarm Server/Viewer, Events, State-owned Enterprises (SOE's), Capture Blocks, Dynamic Data Recorders, Trending, Trip History Log, Creating/Modifying HMI Screens, Screen Navigation, and Communications Modbus, Hart, Distributed Network Protocol (DNP)/International Electrotechnical Committee (IEC) Protocols.

March 1-2, 2016, Dhaka, Bangladesh - Workshop on Clean Coal Technology - Super Critical & Ultra Super Critical Technological Approaches for Coal Based Power Plants:

Senior-level managers, engineers, and plant operators from the BPDB and its subsidiaries, participated in a two-day workshop focused on introduction and implementation of proven utility operation and maintenance best practices, training programs, diagnostic tools, and environmental controls for coal-based power plants. Discussions were led by two experts from Tata Power Company Ltd.

CENTRAL AFRICAN POWER POOL:

EUPP worked with the Central African Power Pool (CAPP) to assist them in achieving their mission of efficient utilization of the huge hydroelectric and gas potential of Central Africa. EUPP and CAPP discussed how to create an interconnected system of national grids and a free exchange electricity market; secure the power supply of member states; promote and coordinate the development of regional power infrastructure (studies and project implementation); and increase the regional electrification rate in order to satisfy energy demand.

The following activity occurred under this partnership:

December 2007 - Workshop for the Review the CAPP Electric Code: EUPP sponsored 8 legal experts from a coalition of member utilities, regulatory commissions and energy ministries in CAPP, known collectively as the “Committee of Experts.” The purpose of the workshop was to review with PA Consulting, USAID’s other capacity building partner with CAPP, the Electric Code drafted by PA that laid out the laws and regulations necessary to operate CAPP.

DEMOCRATIC REPUBLIC OF THE CONGO (DRC) HYDRO PARTNERSHIP:

The EUPP partnership with the DRC focused on the development of the Inga III hydropower project. Topics covered under this partnership included:

- Construction and design of hydro dams;
- Role of public/private partnerships;
- Financing hydro power projects; and
- Construction challenges in the planning and construction phases of developing large hydro projects.

Activities under this partnership included:

November 30-December 13, 2014, Rio de Janeiro and Brasilia - Executive Exchange on Hydropower Development in Brazil for the DRC Stakeholders: This executive exchange was designed to allow the key stakeholders in the DRC responsible for the power sector reform and developing the Inga III hydropower project to meet with principal stakeholders, government entities, and private sector companies responsible for the developing hydropower projects in Brazil. The purpose of the exchange was to allow the DRC participants to interact

with Brazilian counterparts to discuss public/private partnerships, regulation, financing, and environmental and social impacts of large hydropower projects.

November 14-24, 2015, Washington, D.C., White Plains/Buffalo, NY, and Montreal, Canada - Executive Exchange on Regional Hydropower Development in the U.S. & Canada for DRC Stakeholders, U.S.: USEA conducted an executive exchange for the key stakeholders in the DRC responsible for the development of the Inga III hydropower project. This executive exchange was designed to allow the key stakeholders in the DRC responsible for the power sector reform in the hydropower sector to continue discussions on public/private partnerships, developing and maintaining hydropower projects, mitigating negative impacts on local communities throughout the construction and operation of large scale hydro power projects, and best practices in PPAs.

ETHIOPIA UTILITY (DISTRIBUTION) PARTNERSHIP:

The Ethiopia Utility Partnership focused on assisting the Ethiopian Electric Utility (EEU) with improving its operations, maintenance and leadership to reduce outages and accidents. The partnership focused on the following:

- Optimizing distribution utility operations;
- Substation maintenance and safety; and
- Leadership training.

Activities under this partnership included:

November 10-11, 2015, Addis Ababa, Ethiopia - Smart Metering: Workshop for EEU: Utility executives from the EEU, the Ethiopian Energy Authority (EEA) and Ministry of Water, Irrigation, and Energy (MoWIE) officials participated in a two-day workshop on best practices in smart grid and advanced metering

May 30-June 2, 2016, Addis Ababa, Ethiopia - Metering, Billing and Loss Reduction: a Workshop for the EEU: Executives from the EEU met with their peers from utilities and meter and software manufacturers to learn about strategies, technologies, and techniques for improving distribution utility performance. The participants discussed a range of issues, including strategies for reducing technical losses, combatting electricity pilferage and meter tampering, and new information and data analysis technologies. The workshop highlighted three important topics: the importance of loss reduction to system stabilization; the relationship between smart metering, AMI and revenue enhancement; and billing and collections best practices, prepayment systems, and new technologies.

January 23-27, 2017, Addis Ababa, Ethiopia - Substation Maintenance Training: Meralco Power Academy of the Philippines held a 5-day course to provide the EEU participants with the basic knowledge and skills needed to perform electrical operations and maintenance on a Medium Voltage (MV) Distribution Substation, establish safety procedures, and improve equipment maintenance.

March 27-31, 2017, Addis Ababa, Ethiopia - Substation Maintenance Training: This 5-day course was a repeat of the January course, designed to provide distribution utility participants from the EEU with the basic knowledge and skills needed to perform electrical operations and maintenance on a MV Distribution Substation according to established safety procedures and

best utility practices on equipment maintenance. The activity included a site visit to two substations in Addis Ababa city center and the local load dispatch center.

October 9-13, 2017, Addis Ababa, Ethiopia – Substation Operation & Maintenance Training: USEA facilitated the second Substation Operation and Maintenance Training for the EEU. The objective of this training, delivered by Tata Power (India), was to enhance EEU technical personnel’s professional skills essential for safe and efficient operation and maintenance of a distribution substation. The training focused on the maintenance and testing requirements for common substation devices, including, but not limited to, power transformers, current transformers (CT) and potential transformers (PT), oil, air and vacuum circuit breakers, switchgear, ground grid systems, batteries, chargers, insulating liquids, arrestors, capacitors, regulators, and protection systems.

October 23-27, 2017, Washington, D.C., United States – Leadership Training: USEA facilitated leadership training for top EEU Executives. The 5 day program was designed to give the 7 senior managers both a solid understanding of management and leadership and an opportunity to discuss and develop strategic plans for changes occurring within the company. Key areas of discussion revolved around top-down and bottom-up management, situational leadership, change management, engagement and motivation, team leadership and development, delegation and time/task management, and communication.

GHANA UTILITY PARTNERSHIP:

The objective of the Ghana Partnership was to improve the institutional capacity of Ghanaian entities – including the Ministry of Energy, the regulators, and transmission, distribution, and generation utilities - on the following topics:

- Integrated Resource and Resiliency Planning; and
- Competitive procurement of natural gas and liquid natural gas (LNG).

Activities under this partnership included:

April 21-May 2, 2017, Chattanooga, TN; Sacramento and San Francisco, CA; and Washington, D.C., U.S. - Executive Exchange on Integrated Resource and Resilience Planning: Representatives of Ghanaian utilities, distributors and regulators participated in an executive exchange on Integrated Resource and Resilience Planning (IRRP). The twelve-member Ghanaian delegation met with U.S. utilities, independent operators, state regulators and international development agencies to discuss planning and the integration of renewables.

September 18-20, 2018, Accra, Ghana - Capacity Building Workshop on Competitive Procurement of Natural Gas Supplies and Infrastructure: This three-day workshop covered best practices in competitive procurement, with a focus on examples in natural gas and LNG infrastructure to assist Ghana as it moves forward with natural gas and LNG projects. Discussions centered on RFPs and contracts, changes necessary (regulatory, legal, procedural etc.) to ensure procurement process is competitive and maximize bidders, characteristics of gas to power systems and necessary infrastructure, world LNG and natural gas markets and financing of projects, and the establishment of a West Africa Hub market & pricing

GREENING THE GRID (GTG) SYSTEM OPERATORS PARTNERSHIP:

The objective of the GTG partnership was to improve the institutional capacity of the Indian system operators, on the national, regional and state levels, to better handle the variability, uncertainty, and challenges specific to large volumes of renewable energy (RE) resources on the grid. Capacity building for the system operators focused on the following areas:

- Forecasting and Scheduling;
- Ancillary Services;
- Market design;
- Frequency control;
- Infrastructure;
- Policy; and
- System studies, including simulations and transmission pricing.

Activities under this partnership included:

July 20-24, 2015, New Delhi, Mumbai and Bangalore, India - Scoping Mission: GTG India: USEA staff conducted a five-day scoping mission to identify stakeholders' capacity building needs at the national and state levels (for key renewable energy states) for USAID/India's GTG program. Staff also met with representatives of the private sector to obtain their input on the GTG and explore the options for private sector engagement under the GTG program.

May 16-20, 2016, Massachusetts; New York; Minnesota; and Washington, D.C. - Renewable Energy GTG Executive Exchange: USEA conducted an executive exchange for the Joint Secretary of the Ministry of Power, the Secretary of the Central Electricity Regulatory Commission, and the Chief Executive Officer (CEO) of the Power System Operation Corporation Limited. The objective of the executive exchange was to forge relationships and explore long-term partnerships between the Government of India (GOI) and think tanks, research institutions, universities, and ISOs in the U.S. in efforts to scale up renewable energy in India. The executive exchange enhanced knowledge of policies and pilots that could support renewable energy grid integration in India, particularly as it relates to pilots that can be conducted under GTG.

June 15-17, 2016, India - Introduction to Forecasting of Variable Renewable Energy (vRE) Bootcamp: USEA conducted a 3-day training for approximately 75 executives from power system operators and utilities to provide them with the fundamental knowledge they need to improve their procurement and utilization of wind and solar forecasts in system operations. Participants discussed how forecasts are produced, became familiar with forecasting terminology, and learned how forecasts are used and how to evaluate a forecast.

July 11-August 30, 2016, India - Justin Sharp meetings with Power System Operation Corporation Limited (POSOCO) and Clean Energy Resource Center (CERC): USEA contracted with Justin Sharp of Sharply Focused, a consultancy offering a broad spectrum of consulting services on renewable energy resources, to be one of the speakers at the second vRE forecasting workshop (July 25 – 27, 2016, Delhi). In addition, USAID/India organized two days of meetings for Mr. Sharp with POSOCO and CERC, to discuss the issues facing India as it plans for large scale vRE integration. Mr. Sharp provided his insights with both organizations, as well as provided a recommendations paper for USEA and USAID based on his observations.

July 25-27, 2016, India - Integrating and Implementing vRE Forecasting Bootcamp: This training was a follow-up to the June 2016 training, providing a much more detailed analysis of vRE forecasting. Participants included a large number of state and regional load dispatch center employees.

July 28 - August 3, 2016, India – Xcel Energy Robert Staton Peer Review of Maharashtra State Load Dispatch Center (SLDC) and Western Regional Load Dispatch Center (RLDC): Xcel Energy PSCo Control Center Manager conducted two-day peer reviews of these Indian load dispatch centers. The peer review consisted of plenary sessions with staff, individual interviews with key resources (leadership, grid operators, energy management system support staff, outage coordination and other staff), and onsite observations of key facilities. The review examined control room environment and ergonomics, operation tools and techniques, redundancy and emergency operations, scheduling and staffing, training, and physical security.

August 2016 – September 2018, India - Baseline Study: At the request of USAID/India, USEA conducted a baseline survey of Indian load dispatch centers readiness to integrate large volumes of variable renewable energy. USEA hired Mark Sampson, previous control manager at PacifiCorp and consultant to various western U.S. utilities integrating into California’s energy imbalance market, to conduct the survey. The consultant conducted an online survey for distribution to the relevant LDCs to identify current knowledge and readiness related to operation of the power system with large volumes of vRE, along with anticipated capacity building needs. The survey served as a systematic approach to the mapping of existing procedures, tools and competences before the visits to dispatch centers in India. To support the survey, the consultant and USEA conducted two scoping missions to India. The first was to meet with the relevant LDCs prior to completing the online survey; this trip was two weeks in duration and conducted in September 2016. The second was a one-week long trip in March 2017. The consultant and USEA staff met with various power sector organizations who deal with training LDC system operators.

January 4-6, 2017, India – Bootcamp on Ancillary Services: USEA organized a 3-day training for 58 executives to provide power system operators and utilities with an improved understanding of ancillary services to support the transmission of capacity and energy from generation resources (including vRE) to consumers, while maintaining the reliable operation of the transmission system. Participants discussed the variety of ancillary services available, such as regulation and operating reserve, energy imbalance (using market-based pricing), and the cost-based services of scheduling, system control and dispatch, voltage control and black start; how ancillary services can mediate the grid disturbances caused by vRE; and an improved understanding of what ancillary markets are, what services they include and the challenges involved in building an ancillary service market. The training was provided by Eskom, Energinet, MISO, Southwest Power Pool, and California Independent System Operator (CAISO).

March 14-17, 2017, New Delhi and Mumbai, India - Institutionalization Scoping Mission: A team, which included USEA Senior Program Coordinator Sarah Blanford, USEA consultant Mark Sampson and USAID/India Program Management Specialist Monali Zeya Hazra, met with relevant stakeholders and training institutions in Delhi and Mumbai who have experience in system operator training or similar areas, and sought their input in how best to structure a long-term system operator training and certification program in India. USAID’s intention is for USEA to create the initial structure for the formal training/certification program, which will then continue beyond the end of the GTG program.

May 8-12, 2017, United States – Executive Exchange on Variable Renewable Energy Forecasting, Grid Balancing and Scheduling: USEA organized a five-day executive exchange to the U.S. for Indian system operators and policymakers to examine U.S. approaches to enabling the economic dispatch of renewable energy, expanded coordination in operations, and resource flexibility. The objectives of this executive exchange were to create a platform for peer-to-peer dialogue to allow U.S. system operators, regulators, policy planners, and representatives from utilities to share experiences and lessons-learned with their Indian counterparts. Issues discussed included renewable energy integration, specifically balancing, storage, and demand-side approaches; challenges of implementing various grid code and reliability standards; U.S. models for regional transmission planning, dispatch and markets; and real-time monitoring using advanced control technologies to allow coordination from central headquarters for more efficient dispatch of renewable energy generation.

June 19-23, 2017, India – Peer Reviews of Gujarat and Karnataka State Load Dispatch Centers (SLDC): Xcel Energy PSCo Control Center Manager Robert Staton and Mark Edstrom - a Management Consultant and Project Manager in the energy sector - conducted two-day peer reviews of these Indian load dispatch centers. The peer review consisted of plenary sessions with staff, individual interviews with key resources (leadership, grid operators, energy management system support staff, outage coordination and other staff), and onsite observations of key facilities. The review examined control room environment and ergonomics, operation tools and techniques, redundancy and emergency operations, scheduling and staffing, training, and physical security.

September 6-8, 2017, India - 1st International Conference: Large-Scale Grid Integration of Renewable Energy in India: The aim of this conference was to bring together Indian stakeholders and international experts and provide them with an opportunity to share their understanding and discuss interventions in the Indian context to enable integration of large-scale renewable energy. At the request of USAID/India, USEA provided assistance to Deloitte who serves as the prime USAID implementer partner for the GTG program, in identifying U.S. speakers to present at the conference. With USEA's assistance, Electric Reliability Council of Texas (ERCOT), MISO and Xcel Energy participated in the conference.

HAITI ENERGY POLICY & UTILITY PARTNERSHIP (HEPP):

HEPP exposed Haitian energy policy makers and utility officials to the necessary policy, regulatory and technical frameworks needed to expand generation, encourage private investment and diversify Haiti's power resources. Through a series of exchange programs to U.S. and third-country utilities, HEPP shared practical information, real-world case studies and best practices related to institutional reform and good governance (policy, legal, and regulatory) as catalysts for private investments in U.S. and third country energy sectors. The partnership introduced best practices in the following areas:

- Energy policy, legal and regulatory frameworks that lead to needed reforms to modernize the electricity sector;
- Measures to encourage private sector participation and investment;
- Cross-border electricity trade;
- LNG imports and utilization;
- Grid-connected renewable energy;
- Reduction of electricity distribution losses (commercial, technical, and theft);

- Billing and collections;
- Solar micro-grid maintenance;
- Pilot project for sustainable electricity distribution (PPSELD);
- Capacity building for the technicians in renewable energy;
- Importation and utilization of LNG; and
- Renewable energy development and integration.

The following activities took place under this partnership:

January 21-28, 2014, Port au Prince, Haiti - Definitional Mission to prepare the launch of the Haiti Energy Partnership Program (HEPP): USEA conducted a definitional mission to Port-au-Prince, Haiti and Santo Domingo, Dominican Republic in preparation for the launch of the Haiti Energy Policy and Utility Partnership Program (HEPP), funded by USAID/Haiti.

April 20-27, 2014, Bogota, Colombia - Executive Exchange on Best Practices in Electricity Sector Reform and Governance: Seven senior executives from the Government of Haiti and Electricité d'Haïti participated in an exchange with their counterparts from Colombia's energy sector to review best practices in electricity sector reform and governance. The exchange, introduced and reinforced best practices in energy policy, legal and regulatory framework reform. Key topics of the program included drivers behind Colombia's electricity sector reform, key laws and regulations governing the electricity sector, private investment in the power sector, and reducing non-technical losses in the distribution system.

September 8-12, 2014, El Salvador - Executive Exchange on Power Sector Reform & Governance: Nine senior energy executives, seven from Haiti and two from the Dominican Republic, participated in the exchange and met with their public and private sector counterparts. Delegates met with representatives from El Salvador's government, regulatory bodies and utilities to learn about their experience with restructuring the country's electricity sector. Delegates were also exposed to the Sistema de Interconexión Eléctrica de los Países de América Central (SIEPAC) transmission line, which interconnects six Central American transmission networks and is enhancing regional electricity supply security.

March 6, 2017, Port-au-Prince, Haiti – Energy Dialogue: The purpose of the dialogue was to provide a venue for the key stakeholders in Haiti to have an open discussion on: 1) How Haiti should promote access through clean energy; 2) The development of public-private partnerships (PPPs) to advance clean energy; 3) The challenges and obstacles to sustainable energy in Haiti and 4) The role of the government and private sector in utilizing energy for economic growth and the creation of jobs.

March 7-10, 2017, Port-au-Prince, Haiti - Energy Dialogue and Workshop on Metering, Billing, and Loss Reduction. The presentations given at the workshop identified best practices on: efficient and competitive technologies to tackle reduction of technical and commercial losses; the role of the utility in supporting reliable electric supply, minimizing losses, ensuring viable utility business operations, and establishing healthy relationships with customers and the public; technologies and techniques for improving distribution utility performance, focusing on technical, financial and customer service issues; strategies and approaches of U.S. and international utilities on how best to integrate smart grid technologies/systems and customer information systems; and incentives for, and technical and economic challenges to, implementation of advanced meters and smart grid infrastructure.

August 7, 2017, Port-au-Prince, Haiti - Seminar on Developing an Electricity Regulatory Authority: Executives from the Électricité d’Haiti (EDH) and various Haitian ministries and agencies participated in a one-day seminar on creating a new electricity regulatory authority and reforming Haiti’s power sector. During the conference, the participants met with their Jamaican counterparts from the Jamaican Public Service Company Ltd. (JPS) and the Jamaican Office of Utilities Regulation (OUR) to receive advice on the development of an electricity regulator and reforming the utility, EDH.

November 13-17, 2017, Kingston, Jamaica – Executive Exchange on Developing a Haitian Electricity Regulatory Authority. Executives from the Électricité d’Haiti (EDH) and the Ministry of Public Works, Transportation, and Communication (MTPTC) participated in an executive exchange in Kingston, Jamaica where they discussed creating a new electricity regulatory authority and reforming Haiti’s power sector. During the week, participants met with their Jamaican counterparts from the Jamaican Public Service Company Ltd. (JPS), the Jamaican Office of Utilities Regulation (OUR), and the Jamaican Ministry of Science, Energy, and Technology (MSET) to discuss the role that the regulator should have in the electricity sector as well as best regulation practices to implement based on previous experiences had by Jamaica and other island nations in the Caribbean.

May 21-25, 2018, Port au Prince, Haiti - Technical Assistance: Creating a Licensing Framework (1 of 3): USEA worked with London Economics International (LEI) and the Haitian Institute for Energy (IHE) to provide technical assistance to Haiti’s l’Autorité Nationale de Régulation du Secteur de l’Energie (ANARSE), in order to bolster its capacity as a newly established regulatory entity in the energy sector. This technical assistance brought together the key energy sector stakeholders in Port-au-Prince, including Électricité d’Haiti (EDH), Cellule Energie/MTPTC, and the Haitian Bureau of Mines and Energy to discuss the development of a licensing framework that would allow ANARSE to standardize the process for granting and issuing licenses for the generation, transmission, and distribution of electricity. The initial training was developed to assist ANARSE with developing a framework for defining the terms and procedures for granting licenses, work permits and authorizations to carry out electricity generation, transmission, and distribution activities. The objectives of this workshop comprised the following:

- Understanding the challenges associated with market reforms in general, and market liberalization in particular;
- Understanding the nexus between policy objectives, regulatory tools (licensing), contracts and market efficiency;
- Establishing the role, responsibilities and expectations from regulatory body;
- Reviewing the licensing definition and application across power sector activities;
- Discussing the fundamentals of licensing procedure development;
- Presenting licensing best practices and relevance to Haiti;
- Understanding of key contract provisions; and
- Understanding the levelized cost of energy and contract application (Selling/Buying price).

July 23-27, 2018, Port au Prince, Haiti - Technical Assistance: Developing a Tariff Structure (2 of 3): The second in the three-part series of technical assistance focused on the issues of licensing, tariffs, and the allocation of regulatory responsibilities and institutional design of a regulator. The second session focused on developing a cost-reflective tariff for the Haitian

utility, EDH, and other independent power producers (“IPPs”). A set of clear objectives and expectations were defined as follows:

- Understanding fundamentals of tariff design: What? Why? Who? How? When?;
- Reviewing and discussing Haiti’s existing tariff structure and design principles;
- Understanding the concept of utility revenue requirement, and its meaning in the Haitian context;
- Introducing the weighted average cost of capital (“WACC”), and how it is adapted in the Haitian context;
- Comparing tariff design under cost-of-service and performance-based rate structures;
- Assessing tariff design options for Haiti and the appropriateness of performance-based ratemaking (or incentive-based ratemaking);
- Discussing tariff design best practices and application to the Haitian context;
- Providing suggestions on tariff projection methodologies; and
- Developing a tariff design in a context of limited data availability.

September 24-28, 2018, Port au Prince, Haiti – Technical Assistance: Designing a Regulatory Institution and Allocating Responsibilities (3 of 3): Third in the three-part series of technical assistance focused on the issues of licensing, tariffs, and the allocation of regulatory responsibilities and institutional design of a regulator. The third session focused on the following:

- Conducting an assessment of the existing regulatory framework in Haiti, with a gap analysis performed to identify any missing elements and where additional frameworks are needed;
- Defining the roles and responsibilities of ANARSE and internal departments, and the role of external departments in key stakeholders, such as EDH, and MTPTC;
- Identifying the necessary human resources and capacity needed to fill these roles;
- Recommending best practices in public communication tools and standard documentation;
- Developing a strategic plan for the new regulatory entity, providing recommendations for its establishment and operation; and
- Developing a PPA framework and design to use as a template for future contracts.

JORDAN DISTRIBUTION PARTNERSHIP:

The Jordan Distribution Utility Partnership (JDUP) involved three distribution utilities in Jordan (JEPCO, Irbid District Electricity Company (IDECO) and Electricity Distribution Company (EDCO) with the Sacramento Municipal Utility District (SMUD) and National Grid. Topics covered during the partnership included:

- Improving distribution system performance through enhanced maintenance planning, operation procedures and system protection schemes;
- Improving utility energy efficiency, energy conservation and DSM programs;
- Integrating renewable energy into the grid;
- Enhancing tariff pricing methods and regulatory relations; and
- Strengthening training programs for professional /technical development and safety.

Activities under this partnership included:

September 8-12, 2008, Jordan - Definitional Mission. The purpose of the mission was to determine the interest of Jordanian electricity distribution and transmission utilities in participating in partnerships with counterpart U.S. utilities to transfer “best utility practices” to increase the efficiency, reliability and affordability of electric power for Jordan. As a result of the meetings held in Jordan, USEA received funding from USAID/Jordan to fund two partnerships: one with the transmission utility and one combined partnership for the three distribution utilities.

May 24-June 4, 2009, Executive Exchange to the U.S. focusing on Distribution System Planning, Energy Efficiency and Regulation: The first executive exchange on "Distribution System Planning, Regulation and Energy Efficiency Programs for the three distribution utilities. Focused on policy and regulatory initiatives and incentives for energy efficiency programs, the U.S. regulatory environment, and reducing distribution system losses through system design. The first topic, distribution system planning, focused on U.S. system design and protection and how to upgrade the 0.4 kv systems currently in place in the Jordanian Electric Power Company (JEPCO) service territory. The second area of focus was on the regulatory process in the U.S. and equitable tariff setting, providing incentives for energy efficiency and conservation, incentive based performance measures and indicators, reliable and accurate performance reporting to regulators, and other regulatory matters. The delegation also learned U.S. utility best practices to promote consumer energy efficiency and energy conservation, energy load management through DSM and renewable energy technologies.

October 5-9, 2009, Jordan - Executive Exchange Visit for Jordan Distribution Utilities and KEC, Jordan: Discussions centered on best practices to promote consumer energy efficiency and energy conservation, energy load management through DSM and renewable energy technologies; equitable tariff setting; incentive based performance measures and indicators; reliable and accurate performance reporting to regulators; and solutions to the network topology problem in Jordan including optimizing network efficiency by improved planning and increasing distribution voltages.

May 8-15, 2010, Sacramento, California, U.S. - Executive Exchange Visit for Jordanian Distribution Utilities and KEC of Jordan: USEA conducted the third executive exchange for Distribution Utility Executives from Jordan. Seven executives met with SMUD and Tacoma Power to continue discussions on energy efficiency programs and review the training programs as implemented at both U.S. utilities as were discussed in the previous two exchange visits.

May 23-27, 2011, Sacramento, California - Executive Exchange Visit to SMUD by Jordanian Distribution Utilities and KEC – Jordan’s Distribution Utilities: Under the fifth executive exchange for distribution utility executives from Jordan, five executives from met with SMUD to continue discussions on energy efficiency programs, safety and training programs, and distribution system maintenance.

October 22-27, 2011, Sacramento, California, U.S. - Executive Exchange Visit to SMUD by EDCO, IDECO, JEPCO and KEC – Jordan’s Distribution Utilities: The sixth executive exchange for distribution utility executives from Jordan continued discussions on energy efficiency programs and integrating renewables.

May 4-13, 2012, Sacramento, California, U.S. - Executive Exchange Visit to SMUD by Jordanian Distribution Utilities: Eight executives from Jordan’s three electricity distribution

companies, JEPSCO, EDCO & IDECO, traveled for meetings with SMUD to discuss distribution system design; improving maintenance and outage reduction practices; and distribution system planning for integrating renewable generation.

September 10-13, 2012, Amman, Jordan - Executive Exchange Visit to Jordanian Distribution Utilities by SMUD: The 8th executive exchange of distribution utility executives between the U.S. and Jordan was a workshop with SMUD in Jordan. Delegates from IDCEO and EDCO participated in a 4-day workshop at EDCO on building energy efficiency programs for residential, commercial and industrial consumers.

JORDAN TRANSMISSION UTILITY PARTNERSHIP:

The JTUP involved the Jordanian national transmission utility, the National Electric Power Company of Jordan (NEPCO) and Arizona Public Service (APS). Topics under this partnership included:

- Accelerating the integration of renewable energy into the grid;
- Improving NEPCO's integrated resource and capacity planning;
- Improving the reliability and stability of the transmission system by improving planning and operations;
- Introducing advanced techniques for operating the Jordanian electricity market and handling cross-border electricity exchange and cooperation; and
- Strengthening NEPCO's corporate governance and human resource development.

Activities under this partnership included:

September 8-12, 2008, Jordan - Definitional Mission. The purpose of the mission was to determine the interest of Jordanian electricity distribution and transmission utilities in participating in partnerships with counterpart U.S. utilities to transfer "best utility practices" to increase the efficiency, reliability and affordability of electric power for Jordan. As a result of the meetings held in Jordan, USEA received funding from USAID/Jordan to fund two partnerships: one with the transmission utility and one combined partnership for the three distribution utilities.

April 25–May 8, 2009, Washington, D.C.; Charlotte, North Carolina; and Phoenix, Arizona, U.S. - Executive Exchange Visit for NEPCO of Jordan: This was the first executive exchange under the Jordan Partnership. Members of the NEPCO met with various U.S. energy organizations with the goal of introducing and transferring best utility practices for planning, operating, managing and maintaining electric power transmission systems. More precisely, the exchange was aimed at improving transmission system reliability, improving transmission system planning and operations, and accelerating the integration of renewable energy into Jordan's transmission grid.

October 3-11, 2009, Jordan - Executive Exchange Visit for NEPCO: This executive exchange focused on improving transmission system reliability, improving transmission system planning and operations, and accelerating the integration of renewable energy into Jordan's transmission grid.

April 5- 9, 2010, Phoenix, Arizona, U.S. - Executive Exchange Visit for NEPCO: Nine delegates from NEPCO of Jordan traveled to Phoenix, Arizona to meet with their counterparts

at the APS. The exchange visit was aimed at improving transmission system reliability, improving transmission system planning and operations, and accelerating the integration of renewable energy into Jordan's transmission grid.

March 28-April 3, 2011, Phoenix, Arizona, U.S. - Executive Exchange Visit for NEPCO:

Seven delegates from NEPCO of Jordan traveled to Phoenix, Arizona to meet with their counterparts at APS. The exchange visit was aimed at improving NEPCO's generation and transmission planning procedures, introducing modern human resources practices to NEPCO's senior management and improving NEPCO's strategic planning and corporate governance frameworks.

October 17-21, 2010, Amman, Jordan - Executive Exchange Visit to NEPCO: Three delegates from APS traveled to Amman, Jordan to meet with their counterparts at NEPCO of Jordan aimed at improving transmission system planning and operations, accelerating the integration of renewable energy into Jordan's transmission grid and transferring best practices on strategic planning, corporate governance and human resources.

October 2-6, 2011, Jordan - Executive Exchange Visit to NEPCO by APS: This was the sixth executive exchange of transmission utility executives between the U.S. and Jordan to continue discussions on power system modeling, human resources and training programs.

April 14-23, 2012, Phoenix, Arizona, U.S. - Executive Exchange Visit to APS by NEPCO:

The 7th executive exchange of transmission utility executives between the U.S. and Jordan entailed eight executives from NEPCO traveling for meetings with APS. Delegates from both utilities continued discussions on strategic planning and governance initiatives, integrated resource and capacity planning, transmission system planning and operations, and transforming NEPCO's support services departments.

June 16-25, 2012, Phoenix, Arizona, U.S. - Executive Exchange Visit to APS by NEPCO:

The 8th executive exchange of transmission utility executives between the U.S. and Jordan was an executive exchange for eight executives from NEPCO to APS. Delegates from both utilities participated in a 3-day workshop at APS on process improvement and operational efficiency.

KENYA TRANSMISSION OPERATIONS (KETRACO) PARTNERSHIP:

The Kenya KETRACO Partnership promoted best practices in transmission system operations and planning. USEA also subcontracted with Mercados to create the Ethiopia-Kenya-Tanzania (EKT) methodology to enable the sale of electric energy by Ethiopian Electric Power (EEP) to Tanzania Electric Supply Company (TANESCO), and the wheeling of electric energy through the Kenyan transmission system by KETRACO. The partnership focused on:

- Best practices related to resource and transmission planning, project management, asset management, operations and dispatch;
- Operations of a control center; and
- EKT wheeling methodology.

Activities under this partnership included:

October 3-10, 2015, Nairobi, Kenya - Executive Exchange on Transmission Operations:

Three U.S. utility executives from the Midwest System Operator (MISO), Xcel Energy and the

Northwest Power Pool met with senior utility executives from KETRACO as part of a USAID/Kenya funded executive exchange focusing on transmission system planning, operations and energy markets.

June 6-9, 2016, Nairobi, Kenya and Kigali, Rwanda - Meetings on Contract Management, Nairobi: Two experts attended meetings on contract management. Wayne Morton, CEO of Wind Energy Transmission of Texas, and Dennis Donley, Attorney at Naman, Howell, Smith & Lee, PLLC met with KETRACO, NELSAP and Energy Utility Corporation Limited (EUCL) of Rwanda to discuss contract management and issues the entities are having with several contractors.

August 1-3, 2016, Kenya - Workshop on EKT Wheeling Methodology: This workshop reviewed the wheeling methodology for the EKT transaction involving the sale of electric energy by EEP to TANESCO, and the wheeling of electric energy through the Kenyan transmission system by KETRACO.

December 12-17, 2016, Nairobi, Kenya and Arusha, Tanzania - Workshop on the EKT Wheeling Methodology and Tariff: The meetings were instrumental in identifying issues that still need to be resolved before the final methodology and tariff structured can be submitted to the working group (TWG) for final review before submission to the IRB for approval.

July 9-20, 2018, **Nairobi, Kenya - Executive Training on PPAs:** USEA organized a two-week long intense training on key aspects of a well-constructed PPA for Kenya Electricity Generating Company (KenGen) and KPLC.

July 9-13, 2018, **Nairobi, Kenya - Executive Training PPAs and (PPPs:** Over the course of five days, experts in the area of PPA and PPP best practices, delivered presentations to a group of 10 directors from KPLC and KenGen boards of directors, and ERC commissioners. Below is a short summary of the topics covered in the training.

KENYA WIND PARTNERSHIP:

The Kenya Wind Integration Partnership promoted best practices in wind integration through workshops and dispatcher training. The partnership topics included:

- Dispatch of renewables;
- Best practices related to resource and transmission planning;
- Regulatory measures that support the expansion of intermittent generation; and
- Dispatcher training for planners, dispatchers and other senior staff – with a focus on dispatching wind - through simulator training.

April 13-17, 2015, Nairobi, Kenya - Dispatcher Training Program: Fourteen senior dispatchers from KPLC, KETRACO, KenGen and the Electricity Regulatory Commission spent a week in transmission system operator and dispatch training through IncSys. The week-long training course focused on dispatch with wind generation with a heavy emphasis on simulation training. This program targeted the two electric utilities who will be involved with wind generation: KPLC and KETRACO.

August 25- September 2, 2015, Texas and Colorado, U.S. - Operations and Dispatch Executive Exchange: Ten executives from KPLC, KETRACO, KenGen and the Electricity

Regulatory Commission spent a week meeting their counterparts in the U.S. to discuss system operations and dispatch with wind generation. Participants met with ERCOT and Xcel Energy in Golden, CO. Key topics discussed included reliability standards, dispatch of wind, transmission grid operations and planning, and staff training.

November 30-December 11, 2015, Nairobi, Kenya – Training on Kenya Wind Dispatch, Nairobi, Kenya: Twenty-four senior dispatchers from KPLC, KETRACO, KenGen and the Electricity Regulatory Commission spent two weeks in transmission system operator and dispatch training through IncSys. The two-week long training course focused on dispatch with wind generation with a heavy emphasis on simulation training. The first week of training used a generic system while training the second week was exclusively on the future Kenyan system.

NATIONAL POWER TRADING INSTITUTE OF NIGERIA (NAPTIN) PARTNERSHIP:

The Nigeria Energy Partnership was established as a program for NAPTIN and Nigeria’s recently privatized distribution utilities to promote best practices in efficiency, O&M, and regulation. The partnership:

- Introduced commercially-proven approaches to improve O&M of distribution utilities, including training protocol for utility personnel;
- Transferred “best practices” and performance standards utilized in the U.S. to different equipment and areas of power plants;
- Introduced regulatory measures that support the expansion and improved operation of environmentally and economically sound electricity distribution systems;
- Improved efficiency practices and upgrades;
- Improved reliability initiatives and measures;
- Exposed officials to strategic decision-making processes for long-term planning of equipment replacement and upgrades; and
- Reduced technical and non-technical losses in the utilities’ distribution systems.

Activities under this partnership included:

February 2-5, 2015, Nigeria - Metering, Billing and Loss Reduction: A Workshop for Distribution Utilities, Nigeria: USEA and NAPTIN brought together more than 100 participants in Lagos, Nigeria to participate in a workshop designed to address the commercial challenges faced by Nigeria’s recently privatized electric distribution companies (EDCs) and their peers from other West African nations. The objective of the workshop was to introduce the participants to best practices in collections, billing, losses, theft reduction, and marketing.

July 18-29, 2016, Nigeria - “Train-the-Trainer”: Meter Installation & Best Practices” course facilitated by experts from the Meralco Power Academy (MPA): To help initiate the first steps toward the government of Nigeria’s metering goals, USAID Power Africa funded the training of the instructors at NAPTIN and USEA coordinated the planning with NAPTIN’s assistance. The training was provided in two phases. The first phase included in-class instruction and started with an introduction of metering systems, common challenges and emerging technology. The in-class training then covered standards on utility metering systems, metering system construction/installation, system loss, protecting revenue meters and dealing with non-technical losses, the future utility environment and advanced metering infrastructure.

The second phase included hands-on meter installation training and focused on construction standards and practices on customer metering (for various types of customers – simple household, commercial establishments, industrial and primary metered customers including those with imbedded generation).

NILE EQUATORIAL LAKES SUBSIDIARY ACTION PROGRAM (NELSAP) PARTNERSHIP:

USEA designed multiple activities with member countries of NELSAP (Ethiopia, Kenya, Rwanda, Tanzania, and Uganda) on contract and project management of transmission lines. Topics covered included:

- Competitive bidding process;
- Best practices in project management; and
- Contracts and dispute resolution.

April 21-26, 2016, Kigali, Ethiopia - Scoping Mission: Meetings for NELSAP and Ethiopia Partnerships. USEA met with stakeholders in Kigali to determine capacity building needs for the NELSAP partnership.

November 7-11, 2016, Arusha, Tanzania - Project and Contract Management Workshop:

This workshop covered project and contract management for utility employees. Issues include not asking enough (or the right) prequalification questions, not checking references and details in the prequalification bids, and failing to adequately define terms and roles and responsibilities of key participants like the owner engineer.

March 27-31, 2017, Addis Ababa, Ethiopia – Contract and Project Management Training:

This 5-day course was designed to train project managers in the NELSAP region to assist them in managing transmission line projects. A trainer from IFE presented a one-week project management training course for transmission utility executives in East Africa. Participants from Ethiopia, Rwanda, Uganda, and Kenya participated, as well as members from regional entities NELSAP and the East Africa Power Pool. The course focused on basic project management with deep dives into issues raised as concerns at previous workshops such as change order management, communication, and dispute resolution.

July 31-August 4, 2017, Kampala, Uganda - Contract and Project Management: The third NELSAP workshop on contract and project management for Eastern African utilities and regional organizations. The 5-day workshop was designed to follow the natural flow of a transmission line construction project, starting with step-by-step bid/tender process discussed on day 1; vendor requirements and bid evaluations discussed on day 2; contract development, including contract pricing and contractor communication issues discussed on day 3; contract negotiations and performance management on day 4; and closing with contract modification, termination and closeout on day 5.

PT PLN PERSERO (PLN) – HAWAII ELECTRIC COMPANY (HECO) PARTNERSHIP:

The PLN – HECO Utility Partnership was established as a program for enhancing Indonesia's capacity for renewable energy development. EUPP partnered PLN, the state-owned utility in

Indonesia, with HECO to establish utility best practices in renewable energy procurement, planning and operations. Key topic areas were:

- Reliability and grid stability with intermittent generation resources;
- Utility – regulator frameworks to encourage renewable energy development;
- Best practices in planning for island grid interconnection;
- Biofuels use to reduce fossil fuel consumption;
- Renewable energy technologies;
- Policies, incentives and regulatory best practices for the promotion of renewable energy;
- Renewable energy project development & financing;
- Interconnection of intermittent resources; and
- Distributed generation.

Activities under this partnership included:

April 2013 – Oahu and Maui, Hawaii, U.S. - Executive Exchange on Clean Energy Development: In order to identify best practices in renewable energy integration, PLN delegates met for five days with Hawaiian utilities, regulatory bodies, state energy agencies and energy companies. Nine senior managers from PLN traveled to Oahu and Maui for meetings with Hawaiian Electric Company, Maui Electric Company, First Wind, H-Power, Hawaii Public Utilities Commission, Hawaii State Energy Office and SunPower.

September 16-20, 2013, Hawaii, U.S. - Executive Exchange on Clean Energy Development: This executive exchange focused on enhancing the capacity of PLN to develop and integrate renewable energy generation sources.

October 2014, Hawaii, U.S. - PLN Clean Energy Utility Executive Exchange to Hawaiian Electric Company: Executives from PLN and the Ministry of Energy and Mineral Resources participated in an executive exchange to Hawaii to meet with representatives of the Hawaiian Electric Companies. This exchange was the third activity under the partnership to explore best practices for integrating clean energy projects into their energy portfolios.

March 24-April 2, 2017, Sacramento, California, U.S. - Clean Energy Executive Exchange Program: A group of executives from several government organizations in Indonesia, including the PLN, the Ministry of Energy and Mineral Resources (MEMR), and the Ministry of National Development Planning (Bappenas) visited a number of U.S. organizations to discuss renewable energy issues and challenges, technologies, best practices in project development and financing, interconnection and integration of renewables.

March 10-17, 2018, Jakarta, Indonesia - Indonesia Executive Exchange on Integrating Renewables: This executive exchange provided the Indonesian delegation an insight into California's aggressive renewable energy portfolio along with their clean energy initiative. Organizations that met during this exchange included the California Public Utility Commission (CAPUC), Pacific Gas and Electric (PG&E), the California Energy Commission (CEC), the CAISO, and the SMUD. Indonesian executives gained CAISO exposure to grid integration (as closely related to bidding mechanisms), Smart Grid, net metering, and bidding mechanisms.

August, 2018, California, United States – Executive Exchange on Electricity Contract Transformation for vRE: The Indonesia partnership conducted a final executive exchange with

a delegation from PLN visiting regulators and utilities in California. The purpose of the exchange was to provide the participants the opportunity to exchange knowledge and information with the organizations in California on electricity contracts that support high penetration of variable renewable energy.

PAKISTAN UTILITY PARTNERSHIP:

The Pakistan Partnership worked with government-owned electric power distribution companies in Pakistan to improve their performance in the areas of loss reduction, revenue collection and customer service. USEA's utility exchanges enabled U.S. and third-country utilities to share practical information, real-world case studies and best practices with their counterparts in Pakistan so they can solve these problems themselves.

December 1-3, 2015, Washington, D.C., United States – U.S.-Pakistan Clean Energy Business Opportunities Conference: USAID Pakistan mission provided funds to USEA to assist in the organization of this conference focused on clean energy business opportunities which exist in Pakistan for U.S. companies.

November 13-17, 2017, Bangkok, Thailand - Competitive Bidding - Reverse Power Auctions (RPAs): EUPP conducted one five-day workshop on competitive bidding and RPAs, targeted at Pakistan's Ministry of Energy, Alternative Energy Development Board (AEDB), Private Power Infrastructure Board, and provincial energy departments to introduce participants to RPAs, identify best practices, and provide some insights regarding the type and design of auctions. The activity focused on evaluating regulatory frameworks, power purchase sales/agreements, and case studies regarding RPAs into the power grid.

RWANDA ENERGY PARTNERSHIP:

USEA completed a short term technical assistance to assist EUCL with reviewing the current status of the cross-border distribution lines and propose cost-effective measures for control of power flows – for both increasing imports into Rwanda when needed and reducing inadvertent exports.

September 2018, Kigali, Rwanda - Short Term Technical Assistance in Power System of Rwanda: The main objective of this short term technical assistance was to assist EUCL with reviewing the current status of the cross-border distribution lines and propose cost-effective measures for control of power flows – for both increasing imports into Rwanda when needed and reducing inadvertent exports. The main activities performed included:

- Evaluated at ground level within the Rwanda Energy Group (REG) and EUCL the operational issues and challenges related to existing interconnection lines between Rwanda and neighboring countries (Uganda, DRC and Burundi);
- Provided recommendations for implementable actions to enhance the utilities ability to cope with issues and challenges identified in Task I; and
- Assessed the planned high voltage interconnections and provide recommendations for operational readiness of the utilities to operate in interconnected system.

SENEGAL ENERGY PARTNERSHIP:

USEA organized workshops in Senegal on project assessment, finance, PPAs, and integrating renewables. Workshop participants learned about experiences from international industry experts in integrating large amounts of variable renewable energy to the grid, and sought ideas and feedback on how Senegal can meet its renewable energy targets. The participants also identified areas of collaboration between Senegal and other international utilities on grid integration of renewable energy. Topics of discussion included:

- Load dispatch and simulator training;
- Project planning and finance;
- Grid stabilization;
- Principles of wind/solar projects;
- Renewable energy grid integration studies and role in planning;
- Risk assessment and determination;
- Practices to increase balancing resources (flexible generation, storage, and demand response);
- Implementation of a public-private partnership projects; and
- Power purchase agreements and negotiations.

November 30-December 1, 2015, Dakar, Senegal - Scoping Mission: USEA visited Senegal and met with key stakeholders to identify the areas where USEA would provide additional capacity building support to the Ministry of Energy and the parastatal electric utility, Senelec.

March 22-24, 2016, Dakar, Senegal - Workshop on Renewable Energy Project Planning & Finance: Participants from different government agencies learned about best practices for integrating large amounts of variable renewable energy to the grid and received ideas and feedback on how Senegal can meet its renewable energy targets.

July 18-28, 2016, Dakar, Senegal - Dispatch Simulation Training for System Operators: The training was an 8-day workshop facilitated by Pierre Jozs. The workshop focused on power systems dynamics and modelling, integration of renewables and associated impacts on system operation) with a mixed blend of theoretical presentations around fundamental power system concepts and dedicated exercises with the use of specific TE software (EGIDE and EUROSTAG-LTS).

January 21-February 2, 2017, Dakar, Senegal - Dispatch Simulation Training for System Operators: The objective of the training was to improve the trainees' knowledge of the different phenomena they are currently faced with and will be confronted with in the future. These barriers include power/frequency control and secondary reserve margin, integration of variable renewable energy, and the dynamic behaviors associated with the system response. The training was comprised of theoretical presentations as well as realistic case studies and hands-on applications.

November 16-24, 2017, Dakar Senegal - Grid Stabilization Study in Senegal: USEA contracted with an agency to conduct a grid stabilization study in Senegal. The consultants validated the characteristics of the six existing plants: Cap des Biches, Bel-Air, Kounoune, Contour Global, Kahone and Tobene Power, in Senegal. Once the validation was complete, the submitted a draft Inception Report which outlined their findings including the technical requirements for the connection of power plants to the Senelec transmission system.

TANZANIA CAPACITY BUILDING PARTNERSHIP:

USEA provided capacity building support (1) to TANESCO and the Zanzibar Electricity Corporation (ZECO) through a utility partnership program and (2) to the Tanzania Petroleum Development Corporation (TPDC) through workshops and an executive exchange. USEA established the Tanzania-U.S. Utility Partnership to assist TANESCO AND ZECO to learn about utility best practices from their counterparts in the U.S. Additionally, USEA conducted workshops and an executive exchange to the U.S. to improve the capacity of TPDC to develop the natural gas sector in Tanzania.

The following activities took place under this partnership:

April 13-20, 2013, Tanzania - Workshop on DSM (Energy Efficiency & Demand Response) and Advanced Metering, Tanzania: The workshop included representatives from TANESCO, ZECO, the Energy and Water Utilities Regulatory Authority (EWURA), and the Ministry of Energy & Mineral Resources.

July through August 2013, Tanzania - Technical Assistance Assignment: Under the Power Africa Initiative of the U.S. Government, USAID/USEA provided technical assistance to TANESCO. Three energy industry experts — Tony Rodrigues of TR Energy Services, Pamela Morgan of Graceful Systems, LLC, and John Beardsworth of Hunton and Williams LLP assessed the status of TANESCO in the following areas: transmission; regulatory relations and activities, PPAs, and fuel supply agreements.

November 2013, Tanzania - Technical Assistance Assignment: Two experts traveled to Tanzania to continue work with TANESCO on maintenance, protection, and planning.

March 24-28, 2014, Manila and Cebu, Philippines - Executive Exchange on Increasing Access to Electricity by Improving Billing, Collections, and Metering: The delegation examined best practices in customer service and communications, loss reduction and billing and collections.

April 7-11, 2014, Tanzania - Transmission Modeling Training: as a continuation of the “Transmission Operations” Workshop: USEA conducted the training developed by Mr. Don Johnson of Portland General Electric for TANESCO in November 2013 for TANESCO’s system operators.

May 12-16, 2014, New Delhi, India - Executive Exchange on Increasing Access to Electricity by Improving Control Center Operations: Energy executives from the TANESCO, ZECO, Ministry of Energy and Mineral Resources (MEM) and Energy and Water Regulatory Authority (EWURA) participated; the 14 member Tanzanian delegation met with their counterparts from the Tata Power Delhi Distribution Limited (TATA) and Power Grid Corporation of India Limited (POWERGRID); during the exchange, the delegation examined best practices in control center operations, planning, reliability and supply.

November 18-22, 2014, Tanzania - Workshop on Transmission Operations: The objective of the workshop was to allow the management of TANESCO and ZECO learn about utility best practices from several U.S. utility representatives.

December 10-13, 2014, Dar es Salaam, Tanzania - Workshop on Industrial Energy

Management: The workshop was conducted with two distinct goals; (1) to train the management of TANESCO to learn about best practices in utility sponsored industrial energy efficiency programs from their counterparts in the U.S.; and (2) to inform the industrial customers of TANESCO on the best practices of industrial energy management. The key takeaways would be to learn to administer industrial energy efficiency programs at TANESCO and to find opportunities for energy efficiency at the facilities of the industrial customers.

August 10-14, 2015 – Washington, D.C. and Sacramento, California, U.S. - Executive

Exchange on Utility Board Governance for TANESCO's Board of Directors: Members of TANESCO's Board of Directors and selected senior managers participated in an executive exchange in the United States to learn best practices on corporate governance, ethics, financial and oversight issues specific to the utility sector, change management, corporate restructuring and PPPs. The exchange focused in particular on the respective roles of the Directors and senior managers, effective communications, and oversight of technical improvements, financial structure and personnel policy changes that utilities need to make to operate at the highest level.

August 25-26, 2015, Zanzibar, Tanzania - Oil & Gas Development In Tanzania: A

Workshop on Best Management Practices, Legal Agreements, and Policy: The objective of the workshop was to introduce the participants to important concepts and strategies relevant to developing Tanzania's oil and natural gas infrastructure. This workshop is the first in a series of capacity building exchanges intended to support the various agencies and companies in Tanzania charged with implementing, regulating and/or oversight of oil & gas exploration, production, transmission and distribution.

March 27- April 2, 2016, Houston, Texas, Cameron, Louisiana, and Washington, D.C.,

U.S. - Executive Exchange on Gas Pipeline Management and LNG Policy: Participants from Tanzania's Energy and Water Utilities Regulatory Authority and the newly formed Oil and Gas Bureau in the Office of the President traveled on an executive exchange to the United States to learn best practices on investment and strategic planning; market analysis of natural gas pipelines; management and administration of upstream and downstream natural gas; and the planning, operations and management of LNG terminals. The delegation visited Cheniere's Sabine Pass LNG Terminal in Cameron, Louisiana and met with their counterparts and executives

June 6-8, 2016, Arusha, Tanzania - Natural Gas Supply Chain Workshop: Contract

Negotiations and Fiscal Regimes. The objective of the workshop was to introduce the participants to important concepts and strategies relevant to developing Tanzania's natural gas infrastructure. This workshop was the third in a series of capacity building exchanges intended to support the various agencies and companies in Tanzania charged with implementing, regulating and/or oversight of gas exploration, production, transmission and distribution. Topics discussed during this workshop included contract negotiations, host government agreements, gas sales agreements fiscal regimes, and production sharing agreements.

June 16 - 22, 2016, Dar es Salaam, Tanzania - Scoping Mission: Tanzania Competitive

Bidding: USEA Program Director Marjorie Jean-Pierre and Alex Viana from Camara de Comercializacao de Energia Eletrica (CCEE) in Brazil met with key stakeholders to analyze needs, assess and make recommendations for implementing RPAs as a competitive bidding platform.

July 26-29, 2016, Morogoro, Tanzania - Competitive Bidding-RPAs: Participants representing the various Tanzanian agencies and companies charged with developing and regulating electricity generation, transmission, and distribution took part in a four-day workshop on RPAs in Morogoro, Tanzania. The workshop provided participants with an introduction to RPAs and helped to identify best practices and insights in reverse auction design. These goals were achieved through case studies, a simulated auction, and discussions on how the process would look in Tanzania.

October 1-9, 2016, Denver, Colorado and Washington, D.C., U.S. - Executive Exchange on Natural Gas Supply Chain: A delegation visited Washington, D.C. and Denver, CO on an Executive Exchange to meet with utility executives, government officials, and various trade associations to discuss the natural gas supply chain. While in the U.S. they learned about best practices surrounding gas distribution networks, pipeline maintenance, and safety standards. The delegation also learned about the current global LNG market.

January 23, 2017-February 2, 2017, Brazil: Executive Exchange on RPAs and Regulating Electricity Generation, Transmission and Distribution in Tanzania: Participants representing the various Tanzanian agencies and companies charged with developing and regulating electricity generation, transmission, and distribution took part in a ten-day executive exchange to Brazil. They discussed RPAs, PPAs, project finance, national energy planning and procurement, competitive bidding processes, and prequalification. Delegates included lawyers, procurement specialists, project managers, and engineers from TANESCO, Energy and Water Utilities Regulatory Authority (EWURA), and the State Mining Corporation (STAMICO).

February 20-24, 2017, Tanzania - Workshop on Contract and Project Management: Participants representing the various regional agencies and companies charged with implementing and regulating electricity generation, transmission, and distribution gathered for a week-long workshop. They discussed drafting and negotiating contracts, project management, dispute resolution, and procurement best practices. Participants included lawyers, project managers, financial analysts, and engineers from Tanzania's Office of the Attorney General, TANESCO, TPDC, Tanzanian Ministry of Finance (MoF) and Planning, Rwanda Energy Group (EDCL/EUCL), Uganda Electricity Transmission Company Ltd (UETCL), Energy and Water Utilities Regulatory Authority (EWURA), Office of the Treasury Registrar.

April 14-22, 2017, Indonesia - Executive Exchange on LNG Policy and Management: A delegation from Tanzania visited Indonesia on an executive exchange to meet with LNG industry stakeholders and visit a LNG terminal. The delegation included members from Tanzania's Gas Negotiating Team and TPDC. The delegation made four recommendations as a result of the executive exchange:

- The Petroleum Upstream Regulatory Authority (PURA) needs to be part of the entire process of LNG development in Tanzania;
- TPDC should be empowered to participate in the entire LNG value chain;
- Domestic gas demand forecasts for Tanzania need to be taken into consideration when negotiating long-term LNG off-taker contracts; and
- No special project law acts should be enacted for LNG projects—the contracts should suffice.

May 1-4, 2017, Houston, TX – Executive Exchange for the 2017 Offshore Technology Conference (OTC): USEA sponsored 2 delegates from TPDC to attend the 2017 OTC conference in order to introduce the latest technologies, best practices, financing techniques, and training resources in the area of natural gas to aid in the development of Tanzania’s oil and natural gas infrastructure.

July 14-23, 2017, Washington, DC and Minneapolis, MN, U.S. - Executive Exchange on Sustainable Energy Sector Governance: A delegation from Tanzania visited the United States (Washington, D.C. and Minneapolis, MN) on an executive exchange. The delegation consisted of Members of Parliament that serve on the Parliament of Tanzania’s Committee for Energy and Minerals. The group had the opportunity to meet with and discuss the energy sector with a variety of government (federal and state) agencies and private sector players with substantial involvement in the sector. While in the U.S. the high-level delegation focused on:

- Developing and strengthening knowledge of the regulator’s role in overseeing public and private utilities for improved governance and sector planning;
- Familiarizing the delegation with renewable energy technologies, policy, and regulation—including a visit to a wind generation plant; and
- Increasing understanding of how private sector can provide capital, and foster innovation and efficiency in the energy sector.

April 9-20, 2018, Morogoro, Tanzania - Financial Modelling Training: This was a ten-day training facilitated by Siemens for 14 personnel with beginning to intermediate knowledge of financial modelling. The participants were from several different departments that encompassed all levels of the natural gas value chain (up-, mid- and downstream), including the Ministry of Energy, Tanzania Revenue Authority (TRA), TPDC, and Petroleum Upstream Regulatory Authority. The training focused on financial modelling and valuation for the natural gas sector to provide participants with the knowledge and tools to work with and interpret models. A primary objective of the workshop was to provide participants with the skills and strategies to understand the application of valuation and financial model across the energy value chain and across the life cycle of the types of projects Tanzania is currently evaluating.

Through EUPP, USEA also ensured that the following previously established programs were continued:

- Jordan Utility Partnership Programs (JUPP) (Transmission and Distribution);
- South/Central Asia Best Practices Partnership;
- Bangladesh Utility Partnership; and
- Utility Partnership for DABS.

Information on activities for these partnerships is included in the partnership activity sections above.

In addition, USEA established eight new regional/global programs:

AFGHANISTAN/CENTRAL ASIA TRANSMISSION PARTNERSHIP:

USEA designed a series of workshops titled “Special Protection Systems for Transmission Operations and Emergencies” to improve transmission reliability and facilitate power exchanges

across Uzbekistan, Tajikistan, Turkmenistan and Afghanistan. This initiative paid special attention to the challenge of connecting Afghanistan's new 220kv North East Power System (NEPS) to allow electricity from Central Asian producers to be exported to Afghanistan.

This regional partnership involved four countries in Central Asia, identified by USAID/ANE and USAID/EGAT, involved in the NEPS, and focused on Afghanistan and neighboring countries.

Activities under this partnership included:

July 22-25, 2008, Istanbul, Turkey – Transmission System Operations Workshop: USEA conducted a four-day Transmission System Operations Workshop for transmission operators from Afghanistan, Tajikistan, Turkmenistan and Uzbekistan. The objective of the Transmission Operations Workshop was for representatives of from the Central Asia Republics (Tajikistan, Turkmenistan and Uzbekistan) to meet with their Afghan counterparts in an effort to facilitate the construction and operation of the transmission corridor between Afghanistan and the Central Asia Republics and to promote confidence in cross-border power exchange.

The program was conducted with two tracks:

Track One: Transmission Operations Workshop

The workshop component was conducted by highly experienced transmission operations staff from the Sacramento Municipal Utilities District (SMUD) of California, and Bonneville Power Administration (BPA) and included participants from DABM in Afghanistan, Barki Tojik in Tajikistan, Turkmenenergo, in Turkmenistan, CDC Energia in Uzbekistan and TEIAS the transmission company in Turkey.

Track Two: Utility Orientation for Dr. M. J. Shams, Minister of Economy of Afghanistan and the Newly Appointed Head of DABS-- the Recently Corporatized Afghanistan Electric Utility Dr. M. J. Shams met with senior Turkish representatives from the generation utility (EAUS), the distribution utility (TADAS) and the transmission utility (TEIAS) to get an overview of the current level of privatization in Turkey. Dr. Shams received a thorough briefing on the Turkish power sector restructuring and reform program, which began in the early 1990s. Dr. Shams was able to meet with representatives from each of the three areas. He was also presented Turkey's plan for privatizing the remaining state-owned generation facilities and distribution companies.

February 18-20, 2009, Almaty, Kazakhstan - Workshop on Special Protection Systems (SPS) for Transmission System Operations and Emergencies for Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan: The workshop had two central topics:

- SPS - focused on automatic protection systems designed to detect abnormal, emergency or predetermined system conditions and take corrective actions other than and/or in addition to the isolation of faulted components to maintain system reliability; and
- Protective Relays - devices that measure variances in current and voltage and which can then trip various switches and initiate routines to compensate or correct any abnormal conditions throughout the transmission process.

EAST AFRICA GEOTHERMAL PROGRAM (EAGP):

Renewable energy such as geothermal, solar and wind power allow communities to use natural resources to produce green, clean energy on location. This bypasses the community's need tie into the main electric grid and gives them energy independence.

The EAGP was established in September 2012 to promote the development of geothermal energy resources and projects in East Africa. It also encourages and facilitates the involvement of the U.S. geothermal industry in the region. The EAGP program is a partnership between USAID and the Geothermal Energy Association (GEA). EAGP focuses on six priority countries: Djibouti, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda.

Through EAGP, USEA is providing technical and transaction advisory support and capacity building to public organizations and government ministries involved in geothermal development in the region through executive exchanges, workshops and short-term technical assistance assignments to learn about geothermal best practices from their counterparts in the U.S. and third countries. The benefits to the effected communities that will be effected by increased access to geothermal energy are enormous.

The objectives of EAGP partnership included:

- Providing support to USAID and Power Africa Transactions and Reforms Program (PATRP) in updating and implementing the Power Africa Multi-Donor Geothermal Strategy for East Africa and assisting USAID in developing its own internal Power Africa inter-agency geothermal strategy;
- Improving the enabling environment for geothermal development by improving regional procurement practices;
- Engaging U.S. companies in the development and organization of the East Africa Branch of the International Geothermal Agency;
- Working with industry experts and advisors to provide feedback and guidance based on the findings of the Icelandic International Development Agency (ICEIDA) Feasibility Study for the East African Geothermal Centre of Excellence and help to design curricula for the Centre; and
- Improving the enabling environment for geothermal development by creating/improving the legal and regulatory framework for geothermal development in Ethiopia and the rest of the East African region.

Core Partnership Activities included:

- Fostering U.S.-East African business relationship and geothermal power projects;
- Arranging U.S. industry short-term technical advisory support to East African countries;
- Organizing capacity building seminars and workshops in East Africa with U.S. geothermal industry and institutions; and
- Tracking information on East African geothermal resources, projects, events and opportunities

Activities under this partnership included:

November 21-23, 2012, Nairobi, Kenya – U.S. industry participation and training seminar at African Rift Geothermal Conference (ARGeo): EAGP played a significant role in bringing a strong U.S. presence to the 2012 conference. EAGP assisted in bringing a number of U.S. companies to Nairobi to make presentations at the conference. EAGP assisted in bringing a number of U.S. companies to Nairobi to make presentations at the conference, including Dewhurst Group, Geothermal Resource Group, GeothermEx, Power Engineers, Geothermal Development Associates and Atlas Geosciences, Inc.

U.S. geothermal industry representatives delivered presentations on the following topics:

- Planning, Managing and Financing of Geothermal Projects (short-course);
- The Application of satellite magnetic data, terrestrial Magnetotelluric data and low altitude unmanned air vehicle (uav) Remote sensing Methods: The Nevado Del Ruiz Volcanic Complex, Colombia;
- The U.S. Geothermal Industry – Status, Drivers and Technology;
- Staged Asset Deployment – Commercial and Technical Advantages of Using a Wellhead Generation Unit;
- Cost-Effective Early Stage Geothermal Exploration Using 2-Meter and Geoprobe Shallow Temperature Surveys;
- Improved Secondary Cementing for Geothermal Wells;
- Drifting Cement Plugs for Geothermal Wells;
- The Rate of Success of Drilling Geothermal Wells;
- Cost-Effective Early Stage Geothermal Exploration Using 2-Meter and Geoprobe Shallow Temperature Surveys; and
- Integrated services achieve multi string casing exit and re-drill in geothermal well.

September 30, 2012, Reno, Nevada – U.S.-East Africa Geothermal Partnership Feedback Meeting: Twenty-four U.S. industry representatives attended the U.S. – East Africa Geothermal Partnership Feedback Meeting in Reno, Nevada. The purpose of the meeting was to elicit industry feedback for activities to be included in the EAGP program.

May 6-10, 2013, Nairobi, Kenya - EAGP Capacity Building for Kenya's Geothermal Development Company (GDC) – Module 1 – Introduction to Geothermal Energy and Utilization: Module 1 covered varying topics within Geothermal Energy Utilization, including geothermal geology, geochemistry, power plant design, private sector involvement, financing, exploration and drilling. In addition to classroom instruction, site visits were made to the Menengai geothermal field and the Eburru geothermal plant.

May 27-31, 2013, Nairobi, Kenya - EAGP Capacity Building for Kenya's GDC-- Module 2-- Geothermal Geology and Geochemistry:



Figure 2 U.S. and East African participants learn about planning, managing and financing geothermal projects at a short course from the November 2012 ARGeo Conference in Nairobi, Kenya.

Material in module 2 focused on the roles and responsibilities of a geothermal geologist, geothermal exploration methods, reservoir rocks, hydrothermal alteration, permeability, thermodynamics, well targeting, conceptual models, analog systems and risk management.

June 17-21, 2013, Nairobi, Kenya - EAGP Capacity Building for Kenya's GDC-- Module 3- - Geothermal Geophysics: Module 3 covered geothermal exploration, geophysical methods, development well targeting, resource risk assessment and magnetotelluric methods. The module also included a field visit to Menengai to review geophysical data.

July 8-12, 2013, Nairobi, Kenya - EAGP Capacity Building for Kenya's GDC-- Module 4-- Environmental Policy, Climate Change, and Regulatory Issues: Topics in module 4 focused on regulatory issues in Kenya, environmental effects of exploration, environmental protection strategies and monitoring programs, environmental impact assessments, exploration effects and climate change.

July 29-August 2, 2013, Nairobi, Kenya - EAGP Capacity Building for Kenya's GDC-- Module 5-- Drilling Engineering: Module 5 covered drilling program planning, drilling safety, casing, cementing, drilling fluids, drilling optimization, drilling bits, hole problems, geothermal well completions, fishing, beacon services, mud logging services, wire line logging and current drilling systems in Kenya and Sub Saharan Africa.

August 19-23, 2013, Nairobi, Kenya - EAGP Capacity Building for Kenya's GDC-- Module 6-- Geothermal Project Management: Material in module 6 covered varying aspects of geothermal project management, including roles and team selection/organization, different project phases, stakeholder management, project scope and objectives, risk management and asset management.

September 9-13, 2013, Nairobi, Kenya - EAGP Capacity Building for Kenya's GDC-- Module 7-- Reservoir Engineering and Field Operations: Material in module 7 covered topics under geothermal reservoir engineering and field operations, including foundational concepts, thermodynamic uncertainty, hydrothermal framework of reservoirs, project feasibility, well testing measurements, reservoir model development, exploration planning, well flow, confirmation well planning, reservoir management and well testing, well log, economic analysis and complete well testing.

September-October 2013, United States – Executive Exchange for nine East African delegates from Kenya and Ethiopia to the 2013 GRC Annual Meeting and GEA Geothermal Energy Expo: Nine East African delegates from Kenya and Ethiopia traveled to the U.S. to attend two workshops: “New Developments in Power Plants” and “Geothermal Exploration in the 21st Century”; two 1-day pre-meeting field trips: Las Vegas Valley Geology and Hoover Dam and Goodsprings Waste Heat Facility; one post-meeting field trip to Imperial Valley, California.

December 1-3, 2013, Nakuru, Kenya - Technical Assistance to GDC for Data Management Assessment – Phase I: As part of its Power Africa activities, USEA conducted a five-day data management covering the data sampling, infrastructure, workflows, and management policies of the GDC.

December 9-12, 2013, Nairobi, Kenya – EAGP Capacity Building for Kenya's GDC-- Module 8-- Power Plant Design, Construction, Management, and Transmission

Considerations: Module 8 focused on fundamentals of geothermal power plant design, construction, and O&M. Among topics covered, power plant designs for dry steam, single- and double-flash, and binary systems were discussed at length, as was equipment design and analysis covering major plant components such as turbines, separators, flashers, piping systems and heat exchangers.

March 1-4, 2014, Nairobi, Kenya – Short Term Technical Assistance to Government of Kenya (GoK) Relating to Geothermal Transactions: EAGP facilitated a short-term technical assistance program for Kenya’s GDC and MoF with respect to key provisions in geothermal Steam Supply Agreements (SSAs). A consultant met with key individuals at GDC, MoF, and KPLC regarding key financial clauses in SSAs and to define potential next steps each of these entities can take to reduce risk with respect to commissioning geothermal plants.

March 10-14, 2014, Nairobi, Kenya - EAGP Capacity Building for Kenya's GDC-- Module 9-- Geothermal Development Business and Finance Principles Related to Public vs. Private Sector Structures and PPPs: Module 9 dealt with geothermal business and finance principles. The material covered was meant to provide a conceptual framework for considering power plant finance applied to geothermal projects. The course covered issues related to geothermal financing risk and risk management, looking at each phase of geothermal development as seen through the primary risk management resources of rights, contracts and information. Two examples of geothermal energy and financing – Iceland and the U.S. – were used and applied to the Kenyan context to gain insights into the overall finance and development of a comprehensive geothermal power portfolio within a country. Roles and structures for the private sector in public geothermal power projects, including public -private partnerships, also factored prominently into the course material.

April 18-27, 2014, Washington, D.C. - Geothermal Policy and Finance Exchange: This Geothermal Policy and Finance Exchange was designed for senior-level East African government officials to engage in the GEA International Geothermal Showcase and associated meetings and the exchange offered participants from the East African governments excellent opportunities to build relationships and share views with U.S. geothermal companies, U.S. Government agencies and other organizations involved in geothermal development and financing.

May through September 2014, Kenya - Short Term Technical Assistance to GDC Kenya Relating to Baringo-Silali: EAGP, under the Power Africa Initiative, facilitated a short-term technical assistance program for Kenya’s GDC on producing a joint development agreement (JDA) for PPPs in geothermal development. A consultant met with key individuals at GDC and MoF regarding legal structures, financially viable project structures for PPPs and developed a set of recommendations for GDC. A separate consultant was retained to produce a market assessment of GDC’s proposed joint development structures and presented the results to GDC for consideration.

August 27-29, 2014, Ethiopia - Power Africa-African Union Commission (AUC) Workshop on Key Attributes of a Model Enabling Framework for Geothermal Development: The workshop, co-organized by Power Africa and the AUC, was focused on the key technical and policy aspects of an enabling framework for geothermal development; it included sponsored delegates from four East African countries- Uganda, Kenya, Ethiopia and Djibouti, as well as unsponsored participants from Tanzania. The instructors covered a variety of topics, from drilling risk mitigation, to project finance, to project management and regulatory/policy support.

September 27-October 4, 2014, Portland, Oregon; Reno, Nevada; Washington, D.C., U.S. - Power Africa Geothermal Roadshow: Over 40 senior-level officials and industry stakeholders from Djibouti, Ethiopia, Kenya, Rwanda, Tanzania and Uganda participated in the Power Africa-AUC Geothermal Roadshow; the delegation traveled to Portland, Oregon; Reno, Nevada; and Washington, D.C. to meet with private geothermal developers, equipment manufacturers, geothermal service providers and finance institutions. This transaction-focused roadshow aimed to spur interest among private companies to invest in East Africa's rich and abundant geothermal resources by fostering a greater understanding of the opportunities in the region.

October 27-28, 2014, Kenya - ARGeo C-5 Short Course Workshops: EAGP sponsored two pre-conference workshops at the ARGeo C-5. Instructors from the United States, Australia, Iceland, Kenya, Rwanda, and Germany taught two courses, "The Use of Optimized Exploration, Data Management, Conceptual Modeling, and Well Design and Planning to Improve Drilling Successes" and "Financing Geothermal Projects from Exploration through Construction". The courses were attended by delegates from Burundi, Comoros, Democratic Republic of Congo (DRC), Djibouti, Eritrea, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, and Zambia. Each workshop was held over the course of two days and featured presentations from industry experts.

Short Course #1 – Technical: seven industry experts from the United States, Australia, Iceland, and Rwanda taught a two-day pre-conference short course on the "Use of Optimized Exploration, Data Management, Conceptual Modeling, and Well Design and Planning to Improve Drilling Results" Key topics included; (1) designing and implementing an optimal exploration program, (2) introduction to conceptual modeling, (3) data acquisition and management, and (4) case studies on drilling projects in Ethiopia, Iceland, and Rwanda.

Short Course #2 – Financial: nine industry experts from the United States, Australia, Germany, and Kenya taught a two-day pre-conference short course "Financing Geothermal Projects from Exploration through Construction". This two-day event attracted 60 participants from thirteen East African countries as well as Iceland and the United States. Key topics included; (1) developing geothermal projects and financing for each phase, (2) the requirements of private sector project financiers, (3) risk mitigation insurance and incentive programs, and (4) financing mechanisms.

February 9-13, 2015, Uganda - Workshop on Formulation of an East African Geothermal Drilling Code of Practice: The purpose of the workshop was to review the New Zealand Code of Practice for Deep Geothermal Wells (NZS 2403: 1991) and begin the process of adapting it to the East African market. The code of practice is intended to ensure that the best industry practices are adopted in the carrying out of engineering and technical activities in the drilling of deep geothermal wells, including their servicing and repair.

April 13-17, 2015, Addis Ababa, Ethiopia - Database Management Assessment - Technical Assistance for Geological Survey of Ethiopia (GSE): EAGP facilitated a one-week, in-country technical assessment of GSE's current data systems, practices and equipment for collecting, processing, storing and sharing geothermal data. Two U.S. industry experts carried out the detailed assessment of GSE's database and data management systems. The assessment consisted of meetings and interviews with GSE's departments that relate to resource exploration, management, drilling, and associated infrastructure and logistics work. Improved data availability

and quality will promote increased private sector participation in the tendering and PPA processes for Corbetti, Tendaho, and other Ethiopian geothermal prospects in the future.

April 19-24, 2015, Melbourne, Australia - World Geothermal Congress: EAGP sponsored the travel of five geothermal experts from Djibouti to attend the World Geothermal Congress (WGC) in Melbourne Australia to present their technical papers to an international audience at the conference. In addition to the representatives from Djibouti, EAGP attended the event and organized and held a donor coordination meeting with seven different regional donor institutions to discuss assistance for geothermal projects in East Africa and to provide coordination amongst the groups to avoid duplicating activities in the region.

July 6-10, 2015, Addis Ababa, Ethiopia - Workshop on Development of a Geothermal Proclamation for Ethiopia: EAGP brought a team of geothermal legal experts to Addis Ababa, Ethiopia for the first round of meetings with the Government of Ethiopia (GoE) task force to develop a Geothermal Proclamation to govern geothermal development in East Africa. The EAGP legal team reviewed the initial draft of the proclamation prepared in advance by the task force and made suggestions on areas that could be changed in order to strengthen the proclamation to best support geothermal development in Ethiopia. After the week of meetings, the task force requested that the EAGP legal team prepare a first draft of the proclamation incorporating their suggestions and to return for a second round of meetings in August 2015 to continue the work

October 19-23, 2015, Nakuru, Kenya - Technical Assistance to GDC for Data Management Assessment – Phase 2: As part of its Power Africa activities, USEA conducted a five-day data management assessment in Nakuru, Kenya for the GDC in order to review and update the results of an earlier assessment completed in December 2013, which covered the data sampling, infrastructure, workflows, and management policies of the GDC.

March 5-9, 2016, Djibouti, Djibouti - Scoping Mission: In conjunction with U.S. Department of Energy (DOE)/USAID/Power Africa, USEA carried out a five-day scoping mission to Djibouti to collaborate on geothermal development assistance for the country. USEA met with several government bodies to discuss several possible forms of support that would address numerous divisions within their geothermal development operations. USEA also met with international development agencies in order to develop insight on the work being done in Djibouti as well as identifying areas for collaboration.

March 12-20, 2016, Washington, D.C. - Executive Exchange to 2016 GEA International Showcase: Senior officials responsible for geothermal energy at both public and private institutions in Ethiopia and Kenya came to Washington DC in mid-March for a week-long Executive Exchange led by EAGP. EAGP facilitated private meetings between Executives and several private companies, as well as U.S. government institutions. The focal point of the exchange was the Geothermal Energy Association International Showcase. The day-long event offered the delegates an opportunity to highlight the benefits, as well as the challenges, of developing geothermal resources in East Africa.

April 11-15, 2016, Nairobi, Kenya - Scoping Mission for Power Africa Geothermal Support to KenGen through DOE, National Renewable Energy Laboratory (NREL), & EAGP: Following the signing of a MoU between Power Africa KenGen to increase the generation of electricity from geothermal energy, representatives of the DOE, NREL, and U.S. –

EAGP (collectively the “team”) held five days of meetings with KenGen executive leadership and management in Nairobi and Olkaria.

April 25-28, 2016, Iceland - Energy Sector Management Assistance Program (ESMAP)- World Bank Global Geothermal Development Plan (GGDP) III Roundtable & Iceland Geothermal Conference 2016: In order to further identify development opportunities within East Africa’s geothermal sector, the U.S. – East Africa Geothermal Partnership attended the ESMAP – World Bank GGDP III Roundtable and 2016 Iceland Geothermal Conference in. Managed by the World Bank, the Energy Sector Management Assistance Program (ESMAP) offers capacity building support to low- and middle-income countries with the goal of creating environmentally stable energy solutions.

May 23-24, 2016, Kenya - World Bank-GoK Geothermal Strategy Consultation Forum: The Forum convened decision-makers from the GoK, including the Cabinet Secretary and Permanent Secretary of the Ministry of Energy and Petroleum, the CEOs of both KenGen and the GDC, World Bank officials, along with local and international private sector experts to evaluate Kenya’s progress in geothermal, identify barriers to accelerating development, and provide input to a new national geothermal strategy under development with World Bank.

June 13-21, 2016, Kenya - Geothermal Risk Mitigation Facility (GRMF) Application Assistance to GSE: The Forum convened decision-makers from the GoK, including the Cabinet Secretary and Permanent Secretary of the Ministry of Energy and Petroleum, the CEOs of the GSE of both KenGen and the GDC, World Bank officials, along with local and international private sector experts to evaluate Kenya’s progress in geothermal, identify barriers to accelerating development, and provide input to a new national geothermal strategy under development with World Bank.

August -October 2016, Djibouti - Djibouti Drilling: Realizing the threat to U.S. interests posed by power shortages in Djibouti, USEA engaged in a partnership with USAID and the Office de Djibouti du Developpement de l’Energie Geothermique – Djibouti’s Office of Geothermal Development (ODDEG). USEA hired a U.S. company, Capuano Engineering, to provide drilling supervision services to ODDEG during the Government of Djibouti’s first ever geothermal drilling program. The drilling program was successful on its first well and could provide up to 10% of the country’s electricity demand.

August 15-19, 2016, Kenya – Geothermal Reservoir Management & Modeling Support to KenGen through DOE, LBNL, & EAGP: KenGen executive leadership and Geothermal Resource Development teams in Nairobi and Naivasha met with U.S. experts to identify three candidates for medium-term (8 week) internships at LBNL and establish their areas of focus during the internship. In order to do this, the Team spent most of the meetings discussing with KenGen staff their history of developing a reservoir model, the tools used to update the model, and how the current model affects daily operations in Naivasha.

August 20-24, 2016, Djibouti, Djibouti - Djibouti Data Management Assessment: EAGP facilitated a one-week, in-country technical assessment of ODDEG’s current data systems, practices and equipment for collecting, processing, storing and sharing geothermal data. One U.S. industry expert, along with EAGP staff, carried out the detailed assessment of ODDEG’s data management practice.

October 20-27, 2016, Sacramento California - Executive Exchange to the 2016 GEA Geothermal Energy Expo and Geothermal Resources Council (GRC) Annual Meeting:

Comprised of 12 participants from Ethiopia, Kenya, and Djibouti, the exchange offered the delegates a chance to connect with companies that could provide advisory services as well as all ancillary services associated with drilling. By setting up targeted one-on-one meetings with geothermal developers for representatives in each country, EAGP ensured that delegates met with qualified companies that were interested in becoming involved in geothermal projects in East Africa.

October 31-November 7, 2016, Ethiopia- Executive Exchange to ARGeo C-6: EAGP organized a pre-conference short course on “Developing a Legal and Regulatory Framework on Geothermal Development in East Africa”, held at the United Nations Conference Center, and sponsored the participation of 20 East African geothermal professionals. Participants were given a walkthrough of the legislative procedure regarding the formation of laws for geothermal development and power generation.

November 11-20, 2016, Addis Ababa, Ethiopia- Ethiopia Geothermal Law Stakeholder Workshop: Throughout fall 2015, EAGP led a team of geothermal legal experts in the revision of a Geothermal Proclamation; the draft was shared with the public and key stakeholders in early November; on November 19, a public comment meeting was held in Addis Ababa to provide stakeholders the opportunity to give feedback to the GoE task force on the draft Proclamation.

February 4-16, 2017, Berkley, California, U.S. - Executive Exchange to LBNL and KenGen Embedded Assignments for Reservoir Modeling at LBNL: This two-phase program was carried out with assistance from LBNL. Phase 1: KenGen staff participated in an 8-week intensive embedded assignment at LBNL to train on new TOUGH codes. Phase 2: a two-week program with training on TOUGH and a variety of TOUGH codes. This phase was designed for less experienced KenGen staff.

March 9-19, 2017, New Zealand - KenGen Best Practices Exchange on Geothermal Energy Development (1 of 4): EAGP established a Kenya – New Zealand Partnership between Contact Energy and Tauhara North No. 2 Trust (Tauhara) and KenGen of Kenya to share best practices in environmental and social guidelines while establishing professional relationships for KenGen to draw upon after the conclusion of the program. This first exchange focused on introducing the participant companies to each other and determining what topics the New Zealand companies would be best suited to assist KenGen with.

March 23, 2017, Kenya - Stakeholder Workshop on Mitigating Geothermal Risk and the Geofutures Facility: This workshop presented a draft proposal on a risk mitigation mechanism for geothermal development for East Africa.

May 15-19, 2017, Kenya - Kengen Best Practices Exchange on Community Engagement for Geothermal Energy Development (2 Of 4): The second executive exchange in this partnership took place the week of May 15, 2017 in Kenya. A group of ten delegates from New Zealand, representing both geothermal utilities and Maori groups, traveled to Kenya for this program. This second exchange focused on KenGen’s previous experiences with indigenous communities, identifying the topics for the final two exchanges, and introducing the group from New Zealand to the local communities.

June 26-29, 2017, Ethiopia - Introduction to Geothermal Data Management workshop and Ethiopia GSE and EEP Data Management Assessment: EAGP, together with a team of consultants is aiming to improve GSE and EEP's geothermal data management system by providing an introduction to Geothermal Data Management workshop and assessing the current Geothermal Data Management Systems and Procedures from June 26-29, 2017. During this June trip, the team presented the workshop to a group from GSE and EEP and interviewed the appropriate parties in order to prepare an assessment report outlining recommendations for the new geothermal entity going forward.

August 14-18, 2017, New Zealand - KenGen Best Practices Exchange on Community Engagement for Geothermal Energy Development (3 of 4): This third exchange focused on Community Program Creation and Responsible Development. The group held joint meetings for three of the five days, and on the other two split apart to meet with their counterparts to discuss issues relevant to either the utilities or the communities. Three Maasai tribal leaders attended the exchange and were able to speak with the Maori community members and share experiences on strengthening their communities and working jointly with the utilities to advance geothermal development.

October 3-5, 2017, Nairobi, Kenya - Ethiopia GRMF Support: Under EUPP, EAGP sponsored counterparts from EEP and the GSE to travel to Nairobi, Kenya to attend the GRMF Workshop. The GRMF Workshop, hosted by the AUC's Infrastructure and Energy Department, served the dual purpose of kicking-off the 5th round of application funding and as an opportunity for those currently in the process of finalizing their grant to receive feedback from the AUC's evaluation team. At the GRMF workshop, the EAGP team, its technical consultant, and the Ethiopian counterparts from GSE and EEP held face to face meetings with the grant evaluation committee.

December 3-7, 2017, Djibouti, Djibouti - ODDEG Geothermal Drilling Training: The training course was organized by EAGP and led by Capuano Engineering Company's team at the Kempinski Hotel in Djibouti from December 3rd – 7th. ODDEG's team consisted of 24 individual staff members, composed of both engineers and technicians. The Consultants designed the training to provide an overview of the key concepts in geothermal drilling engineering.

December 4-8, 2017, Naivasha, Kenya - Kengen Best Practices Exchange On Community Engagement For Geothermal Energy Development (4 Of 4): A group of ten representatives from New Zealand, representing Contact Energy, Tauhara North No. 2 Trust and the Ngati Tahu traveled to Kenya for this program. This final exchange focused helping both KenGen and the Maasai community to develop the framework of their engagement strategies to guide them going forward.

March 25-30, 2018, Addis Ababa & Semera, Ethiopia – Ethiopia GRMF Alalobeda Geothermal Site Assessment Site Visit: During the trip to Ethiopia, the EAGP team which consisted of one EAGP team member, Ashley Ndir, and two consultants Gordon Bloomquist and Sam Abraham, held meetings in Addis Ababa with the relevant stakeholders and traveled to the Afar region where the geothermal site will be developed. The essential aspect of the visit was to carry out a site visit and assessment of the Alalobeda field. The site visit allowed the team to determine water access for the geothermal drilling team, assess the public works needs and launch the environmental and social impact assessment.

June 11-16, 2108, Addis Ababa, Ethiopia - Ethiopia GRMF Support: USEA's EAGP Senior Program Coordinator, Ashley Ndir, traveled to Addis Ababa to collaborate alongside of GSE and EEP on compiling the necessary documents remaining for the GRMF proposal to the AUC. The GRMF proposal is funding for the Alalobeda Geothermal drilling program.

EASTERN AFRICA REGIONAL TRANSMISSION PLANNING PROGRAM (EATP):

The EATP (including Ethiopia, Burundi, Kenya, Tanzania, Rwanda, and Uganda) was established in 2014 to foster regional cooperation in transmission planning and analysis. The EATP developed the capacity of transmission planners in Kenya, Ethiopia and Tanzania to develop regional electric power transmission corridors that will (1) serve as the backbone infrastructure for trade and exchange of electricity, (2) enable investment in new electric power generation plants, (3) support integration of clean energy generation resources, and (4) improve system reliability. The EATP created a Working Group that continued to further refine the national planning models to support regional harmonization and reviewed regional models. The Working Group members include the following organizations: the Eastern African Power Pool, EEP, Kenya Electricity Transmission Company, Ltd., KPLC, TANESCO, Régie de Production et Distribution d'Eau et d'Electricité, Rwanda Energy Group, Ltd., and Uganda Electricity Transmission Company, Ltd. Under EUPP, the EATP developed regional network planning models, beginning with a load flow model for East Africa, progressing to dynamic models over time. The members of the EATP Working Group were trained to prepare each of the models, expanding the pool of qualified network planners in East Africa to continuously fine tune the regional planning model. Topics covered under this partnership included:

- EATP Regional Network Load Flow Models;
- EATP Load Flow and Dynamic Training;
- EATP Load Flow and Dynamic Training;
- Study to Calculate Losses for the EKT Wheeling Transaction; and
- NELSAP/TRACTABEL Study Review.

November 11-21, 2014, Ethiopia, Kenya, Tanzania - Definitional Mission, Ethiopia, Kenya, Tanzania: EATP conducted a definitional mission to Ethiopia, Kenya and Tanzania to meet with utilities and regulators to discuss developing the capacity of transmission planners in Kenya, Ethiopia and Tanzania to develop regional electric power transmission corridors that will serve as the backbone infrastructure for trade and exchange of electricity, enable investment in new electric power generation plants, support integration of clean energy generation resources, and improve system reliability.

February 25-26, 2015, Ethiopia - EATP Working Group Kickoff Meeting: The Eastern Africa Power Pool (EAPP) hosted the kick-off meeting of the EATP with the objective to commence development of the first detailed regional network planning model created using transmission planning software.

May 18-21, 2015, Arusha, Tanzania - Working Group Meeting and Training Report: The second EATP Working Group meeting and the first training following the EATP Working Group kick-off meeting was held in Addis Ababa in February 2015.

October 6-9, 2015, Kigali, Rwanda - Load Flow Software Training and Working Group Meeting: This meeting built on the accomplishments of the previous Working Group meeting

conducted in May 2015 in Arusha, which focused on developing the first national load flow planning models for the 2020 forecast horizon.

March 1-4, 2016, Entebbe, Uganda - Load Flow Software Training and Working Group Meeting: This meeting built on the accomplishments of the previous Working Group meeting conducted in October 2015 in Kigali, Rwanda which focused on reviewing the first draft of the Eastern African Load Flow planning model.

July 11-14, 2016, Tanzania - Load Flow Software Training and Working Group Meeting: The meeting built on the accomplishments of the previous Working Group meeting conducted in March 2016 in Entebbe, which included reviewing the maximum cross-border Network Transfer Capacities (NTC) calculations, reviewing the Project Tracker list and developing the methodology to create the Eastern Africa system outlook and adequacy forecast.

November 15-17, 2016, Kenya - Load Flow Software Training and Working Group Meeting: The EAPP Planning Committee and USEA conducted a regional Working Group Meeting of the EATP and three-day training program on Project Benefit Assessment and Grid Code Compliance.

March 15-17, 2017, Tanzania - Load Flow Software Training and Working Group Meeting: The EAPP Planning Committee and USEA conducted a regional Working Group Meeting of the EATP and three-day training program on Advanced Static Analysis and Frequency Stability Simulations using Advanced Planning Software.

July 10-12, 2017, Addis Ababa, Ethiopia - EATP Working Group Meeting: This meeting was designed to further enhance the capacity of the participants to perform planning and operational analyses and investigate load flow and stability issues in software, Ethiopia: the meeting provided the opportunity to update the Eastern African Regional Load Flow Planning Model to Version 5.0 for target year 2020; and transfer responsibility for updating and maintaining the EATP model in accordance with the Model Standard Operating Procedures. This was the final close-out meeting of the EATP Working Group

October 4, 2017 – January 8, 2018, Ethiopia, Kenya, Tanzania - Loss Factor Study for EKT Transactions: The purpose of the Loss Factor Study was to develop the Loss Factors that will be included in the Transmission Service Agreement (TSA) as an Appendix. These factors will be used until they are replaced with updated factors in accordance with the provisions set forth in the TSA. Using the 12 power flow cases, the consultant made 12 power flow runs with the 12 power flow cases and determined the total losses in each case on the Kenyan transmission Grid. All twelve Loss Factors were developed by determining what the increase in losses are between the “with” and “without” the 200 MW transaction. These losses were tabulated in MWs and expressed as a percentage of the 200 MW transaction.

ENGENDERING UTILITIES PARTNERSHIP:

Historically, the power sector has been dominated by males - this is particularly true in the developing world. In recognition of and to assist in reducing the barriers caused by the gender gap in the power sector, USEA launched the Engendering Utilities Partnership in coordination with USAID. The partnership aimed to identify and transfer policies and corporate programs that support increased female participation in the power sector. The partnership was launched

with utilities from Georgia, Jordan, Kenya, Macedonia, and Nigeria in order to help the utilities grow and adapt with the community they serve.

Seven international utilities participated in the Engendering Utilities Partnership including:

- Energo-Pro - Georgia
- Irbid Electricity Distribution Company – Jordan
- Electricity Distribution Company – Jordan
- KPLC – Kenya
- EVN Macedonia – Macedonia
- Eko Electricity Distribution Plc – Nigeria
- Ibadan Electricity Distribution Plc – Nigeria

The partnership helped these utilities to improve their gender policies and gender outcomes by improving labor market outcomes, contributing to greater operational efficiencies, increasing profits, enhancing their corporate image, and improving branding opportunities. The partnership introduced best practices in the following areas:

- Increasing female recruitment through the introduction of gender-specific hiring techniques
- Creating an informal mentoring program for women;
- implementing gender-inclusive policies and procedures;
- Customer service and engagement; and
- Succession planning.

Activities conducted under this partnership included:

November 9-12, 2015, Istanbul, Turkey – Regional Workshop on Gender-Focused Hiring for Human Resources Departments and Call Center: This workshop was the first in a series of capacity-building activities to support Human Resource and Customer Service managers charged with hiring and training staff at their respective organizations. Participating utilities included: EVN Macedonia, KPLC & Light Company, Eko Electricity Distribution Plc – Nigeria, Energo-Pro (Georgia); Irbid District Electricity Company Ltd. (Jordan); Ibadan Electricity Distribution Company (Nigeria); and the Electricity Distribution Company of Jordan.

April 18-21, 2016, Germany - Regional Workshop: Gender-Focused Hiring for Human Resources Departments and Call Centers: This workshop was the second in a series of capacity-building activities intended to support Human Resource and Customer Service managers charged with hiring and training staff at their respective organizations.

October 1-6, 2016, Stockholm, Sweden - Workshop on Engendering Utilities: Gender-Focused Hiring Techniques for Human Resource and Customer Service Managers: International utility human resources and customer service managers met in Stockholm to exchange ideas and develop action plans on how to increase the amount of and retain qualified women at their respective utility companies. Participants presented their current policies for recruitment, training, and professional development opportunities for qualified female employees. International and U.S. experts on gender equity and customer service management shared their expertise on gender-specific hiring techniques, employee engagement, and the importance of utility customer service training programs for employees.

May 7-13, 2017, Rome, Italy - Workshop on HR Tools for Increasing Equality: Behavioral Based Interviewing: The objective of this workshop was to assist Engendering Utilities partners to improve their gender policies and gender outcomes. This workshop consisted of a series of capacity-building activities intended to support Human Resource managers charged with implementing gender equality practices and collecting and analyzing data related to gender diversity and gender equality at their respective organizations. The workshop provided training on the rationale, design, development, and implementation of behavioral based interviewing which will enable the participants to implement an objective, non-biased, and systematic interview process in their respective company.

GLOBAL CLIMATE CHANGE (GCC) REGIONAL PARTNERSHIP:

USEA received funding from the GCC office to conduct activities that emphasized the development of clean energy. The majority of the activities were conducted within the Asian region and focused on such topics as:

- Renewable PPAs;
- Power markets;
- RPAs;
- Transmission planning; and
- Grid codes.

Activities under this partnership included:

January 25-27, 2016, Mexico City, Mexico – Regional Workshop on Advancing the Use of Wind and Solar Forecasting in Latin America and the Caribbean: Conducted a regional workshop in conjunction with the NREL as part of the GTG initiative. The workshop focused on wind and solar forecasting integration. Participants were given the opportunity to engage with experts on meteorological forecasting and operational methods for integrating renewable energy into their electricity grid

March 29-31, 2017, Bangkok, Thailand - Scaling up Grid-Connected Renewable Energy through Improved Planning: USEA supported participants and speakers to attend the workshop organized by USAID's Clean Power Asia Office. Sponsored participants included delegates from AEDB, Pakistan; National Transmission and Dispatch Company (NTDC), Pakistan; KEGOC System Operations, Kazakhstan; Philippine Department of Energy (PDOE), Philippines; National Grid Corporation of the Philippines (NGCP); Grid Corporation of India; and ERCOT.

June 5-8, 2017, Philippines- Attendance at the 2017 Asia Clean Energy Forum (ACEF), Philippines: Through EUPP, USEA sponsored the participation of delegates from Uzbekistan, Pakistan, India, Bangladesh, Thailand, Indonesia, Vietnam, Laos, and Cambodia to attend the 2017 ACEF and the Pre-Forum Deep Dive session activities that focused on renewable energy grid integration, geospatial analysis of renewable energy deployment and transmission planning, and RPAs to scale up renewable energy development.

October 24-25, 2017, Almaty, Kazakhstan -Renewable Energy Auctions Workshop: The workshop aimed to introduce entities from Kazakhstan to reverse power auctions, held

specifically for renewable energy. Best practices from Brazil, Mexico, and South Africa were shared alongside general worldwide trends in reverse auction systems.

December 11-13, 2017, Singapore - Workshop on Integrating Variable Renewable Energy on Island Grids: USEA, in collaboration with the NREL, hosted a 3-day workshop on Integrating Variable Renewable Energy on Island Grids in Singapore. The workshop provided an overview of grid integration concepts, the various challenges and benefits of VRE, as well as the best practices in solar and wind power forecasting, load analysis and control, storage technologies, and electricity market design. Expert speakers from the Hawaii Natural Energy Institute (HNEI), Kauai Island Utility Cooperative (KIUC), and the International Renewable Energy Agency (IRENA) spoke on their experience integrating large amounts of renewable energy onto small island grid systems. The countries represented include Papua New Guinea, Fiji, Sri Lanka, Indonesia, and the Philippines.

June 4-8, 2018, Manila, Philippines – 2018 ACEF: USEA sent 30 participants to the ACEF 2018. ACEF is one of the leading clean energy events in the Asia region, focused on bringing together practitioners and implementers to identify, discuss and address the key clean energy challenges faced in the region. Participants attended a wide range of deep dive sessions including *Variable Renewable Energy Grid Integration: Efficient Solutions for Transmission and Distribution Grids* and *Renewable Energy Auctions: A New Paradigm for Asia*.

September 11-13, 2018, Medellin, Colombia – Power Sector Resilience Training Workshop: This workshop better equipped power system operators to incorporate resilience into systems operations and planning by presenting methodologies to understand complex power system risks and devise resilience strategies. Participants employed these methodologies to assess their respective vulnerabilities and create an action plan to enhance their resilience.

SOUTH AND CENTRAL ASIA BEST PRACTICES PARTNERSHIP:

The South Asia/Central Asia Best Energy Practices Partnership brought together key personnel from energy utilities in the countries of the Central Asia Republics (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) and the South Asian countries (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka) to share best practices allowing the success and lessons learned to be transferred between the two regions.

March 21-23, 2011, New Delhi, India, Executive Workshop on Best Practices in Electricity Transmission and Distribution: Through EUPP, over 40 senior energy officials from 12 nations were convened as part of a South Asia & Central Asia Executive Workshop on Best Practices in Electricity Transmission and Distribution. Participants in this regional forum shared best practices for the operation of efficient and reliable electricity systems, including effective transmission and distribution reforms, renewable energy deployment and low carbon power development, and emerging technologies such as Smart Grid. Opportunities and challenges to expanded cross-border electricity trading were addressed throughout the workshop. U.S. electric utility experts from the Bonneville Power Administration (BPA) and SMUD participated each day to provide U.S. perspectives and lessons learned.

SOUTH ASIA REGIONAL INITIATIVE FOR ENERGY INTEGRATION (SARI/EI) PARTNERSHIP:

Nearly 400 million people living in India are living in poverty. The SARI/EI Partnership was launched in 2000 with the goal of promoting energy security through energy cooperation and integration in South Asia. The SARI/EI program promotes energy security in South Asia through three focus areas: 1) cross border energy trade, 2) energy market formation, and 3) regional clean energy development.

The objective of the SARI/EI Regional Energy Markets Activity was to build the institutional capacity of South Asia regional players (Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka). The objectives of the Regional Energy Markets Activity were to:

- Inform and educate regional South Asian governments, public and private entities, academia and others about international experiences in energy markets development;
- Foster partnerships between system operators, electricity traders and regional transmission operators in the U.S. and worldwide with counterpart agencies and organizations in SARI/EI countries; and
- Enhance institutional capacity of South Asian private and public-sector system operators to operate a regional power exchange.

To support the above objectives of EUPP's SARI/EI initiative, special focus was given to:

- The institutional capacity of South Asia private and public-sector officials involved in power trade and power finance to support cross-border electricity exchange between India and its Nepal and Bangladesh neighbors, as well as the other SARI/EI countries; and
- Partnerships between Nepal and Bangladesh, and their Indian counterparts in the areas of power trading and power finance.



Figure 3 Cross-Border Energy Trade: SARI/EI executives meet with Lawrence Musaba, previous manager of Zimbabwe's Southern African Power Pool (SAPP) Coordination Center, at the SAPP Annual Meeting in Botswana.

The following activities took place under the SARI/EI Partnership:

January 2014, India – Scoping Mission: USEA staff traveled to India to participate in meetings of the SARI/EI Project Steering Committee and other stakeholders to design USEA’s role in the next phase of SARI/EI.

March 18-24, 2014, Sri Lanka – South Asia Regional Workshop on Competitive Electricity Market Design, Implementation & Benefits: SARI/EI delegates discussed the benefits of a regional power pool and the steps necessary to form a South Asian energy market. By examining the evolution of various power pools around the world, the participants were exposed to the challenges faced in different political and regulatory environments, as well as the universal benefits achieved by implementing regional electricity markets.

May 19-22, 2014, South Africa - Executive Exchange on SAPP Cross Border Exchange of Electricity, South Africa: SARI/EI delegates had the opportunity to assess and examine varying operations, procedures and mechanisms put in place by SAPP to establish the market. Among these, delegates learned best practices from both ESKOM and SAPP.

August 25-27, 2014, Bangladesh - Executive Exchange on the Bangladesh-India Bilateral Electricity Market: Thirteen energy executives from Afghanistan, Bangladesh, Bhutan, India, Nepal and Sri Lanka met with their counterparts from the BPDB, Power Grid Company of Bangladesh (PGCB) and the Bangladesh Energy Regulatory Commission (BERC).

November 3-10, 2014, Nepal and India - Definitional Mission: USAID led a definitional mission comprising of SARI/EI’s two implementing partners, USEA and IRADe, to Nepal and India and met with key stakeholders to identify the areas where SARI/EI could provide support to the Government of Nepal.

March 15-20, 2015, Nepal - Design Mission: USAID with its SARI/EI implementing partners, USEA and IRADe, and representatives from Power Trading Corporation of India (PTC) and Power Finance Corporation of India (PFC) visited Nepal to meet with relevant stakeholders. The agenda of the design mission was to present to the Government of Nepal the framework and content of the skills development program, identify key training needs of the stakeholders, develop consensus and finalize the training plan for both the Nepal Electricity Authority (NEA) and Investment Board Nepal (IBN).

September 14-18, 2015, November 30-December 4, 2015, & January 4-8, 2016, India - Capacity Building Program for Designing, Managing and Operating a Power Trading Entity (1st round): USEA conducted three modules of training on the design, management and operation of a power trading entity. The training was conducted jointly by PTC India Ltd. (India’s largest power trader) and the National Power Training Institute (NPTI), through a subcontract with PTC. Sixteen delegates were selected to participate in all three modules of the training. The training program was tailored for the Nepalese, to provide them with the institutional and human capacity to design, manage and operate a power trading entity in Nepal to support its capacity to expand cross-border electricity trade with India. The activities, which were targeted at NEA, Government of Nepal representatives and private sector, and included additional representatives from Afghanistan, Bangladesh, and Bhutan, emphasized development of skills and knowledge in the functional operations of power trading.

December 1-3, 2015, Dhaka, Bangladesh – Scoping Mission: Bangladesh Power Trade Assistance: A scoping mission led by USAID and comprising of SARI/EI’s two implementing partners, USEA and IRADe, visited Bangladesh and met with key stakeholders to identify the

areas where SARI/EI could provide additional capacity building support to the Government of Bangladesh.

February 1-4, 2016, Bhutan - Hydropower Development Executive Exchange: USEA conducted a four-day executive exchange in Bhutan to examine the environmental and economic aspects of hydro development. The delegation consisted of 20 executives from Bangladesh, Nepal, and Pakistan, as well as USAID representatives from India and Nepal. Nepal was the target audience of this capacity building program; participation included three members of parliament from the Nepalese Constituent Assembly, seven executives from the Investment Board of Nepal, and representatives from Nepal's Ministry of Energy, Electricity Authority, Hydroelectricity Investment and Development Company Limited, and the Independent Power Producers Association

May 30-June 3, 2016, June 20-24, 2016, and July 25-29, 2016, India - PTC Financial Services Ltd. (PFS) Techno-Economic Hydro Power Project Appraisal Training: USEA organized a three-module (three week program, spread out over three months) training for participants from Afghanistan, Pakistan, Bhutan, Bangladesh, and Nepal to study the Indian hydropower sector and see how some of India's programs and solutions could be applied to hydropower projects in the South Asian Association for Regional Cooperation (SAARC) countries. The workshop was conducted by PFS and NPTI under contract from USEA. Following a request on the part of the Nepalese government for a workshop on hydropower, the aim of these modules was to help the IBN and other organizations of Nepal, as well as representatives from other South Asian countries, develop the skills on techno-economic appraisal and financial analysis for hydropower project and large transmission development. The first two modules were held at the National Power Training Institute in Faridabad, and topics included Project Planning, Project Development, Project Appraisal, Financial Analysis, Financial negotiations and Financial Structuring. For the third module, participants were taken for a site visit at a hydropower dam, and then for meetings at relevant agencies in Delhi.

June 2016, July 2016, & September 5-9, 2016, India - Capacity Building Program for Designing, Managing and Operating a Power Trading Entity (2nd round): After the successful completion of the first round of all the three modules, on specific request from the Participants' Countries, USEA and PTC conducted this training program for another group of participants. As in Round I, the activities were designed to be conducted in 3 modules of five days each. The topics covered a range of subjects from the regulatory and policy environment and evolution to the specific topics related to power trading activities in India and providing them first-hand exposure of the power exchange activities.

September 28-30, 2016, Thimphu, Bhutan - Scoping Mission, Bhutan, Part I: USEA traveled with SARI/EI and USAID/India staff to Bhutan to meet with key stakeholders for a discussion on targeted capacity building needs that Bhutan's power sector needed in order to further promote its cross-border trade with India.

November 2016, participation via webcast to Sri Lanka – SARI/EI Project Steering Committee Meeting: USEA presented on USEA's past and future activities to the SARI/EI Project Steering Committee, via Skype.

December 5-9, 2016, February 20-24, 2017, and June 5-8, 2017, India & Brazil - PFS Techno-Economic Hydro Power Project Appraisal Training (2nd & final round): USEA organized a three-module (three-week program) training for participants from Afghanistan,

Bhutan, and Nepal on Techno-Economic Hydro Power Project Appraisal to examine the environmental and economic aspects of hydro development and cross border electricity exchange. The first two modules of training were designed similar in style to the first round of training, with classroom training provided by PFS and NPTI. The training was held in New Delhi, India. The third module was hands-on and the delegation visited the 14-GW Itaipu Dam and hydropower plant, a joint venture between Brazil and Paraguay, followed by meetings in Foz do Iguazu and Rio de Janeiro.

January 16-19, 2017, Germany - SARI/EI Executive Exchange, Load Forecasting: Examining Best Practices in the German Electricity Market: USEA organized this five-day executive exchange for 16 executives from Afghanistan, Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka to examine best practices in load forecasting in the German power sector. South Asian utility executives were provided with tools to improve the quality of their electricity distribution and transmission operations and planning, as well as to assist them in the transition for expanded cross-border electricity trade. The program allowed SARI/EI executives to learn from German best practices on how to develop load forecasts and maximize their benefits, as well as present opportunities for sharing experiences between Germany and South Asia.

January 9-11, 2017 - Scoping Mission, Bhutan, Part 2: USEA traveled with USAID/India to Bhutan and met with stakeholders from the Bhutanese power sector to discuss USEA's FY 2017 SARI/EI capacity building plans targeted at Bhutan.

January 30 – February 3, March 20-24 & April 17-21, 2017, India - Capacity Building Program for Designing, Managing and Operating a Power Trading Entity - (3rd & Final Module): Similar to the previous two rounds, USEA provided 15 energy executives training on the design, management and operation of a power trading entity. This training was the third round focused on power trading, due to a keen capacity building need in the participants' countries. Once again, the USEA training was conducted by PTC and NPTI. The training was conducted in three modules of five days each, beginning in January and ending in April 2017. Modules 1 and 2 were conducted at NPTI in Faridabad, and Module 3 was conducted at PTC's office in New Delhi. The topics covered the regulatory and policy environment, as well as specific issues related to power trading in India, and provided first-hand exposure on power trading administration and operations.

March 2017, UAE – Sponsorship of Bhutan executives to attend the “Advance PPA Excellence 2017”: The Bhutanese Ministry of External Affairs (MOEA) Department of Hydropower & Power Systems (DHPS) requested USAID, SARI/EI, and USEA to sponsor some of their staff to attend a well-regarded PPA training. The training was to provide the necessary capacity building to their staff, as Bhutan negotiates the terms of PPAs with India. USEA sponsored the Director General and a Chief Engineer of the Department of Hydropower & Power.

June 12-23, 2017, Gainesville, Florida, U.S. - Sponsorship of Bhutan executives to attend the “International Training Program Utility Regulation and Strategy” training: One of the specific capacity building areas Bhutan requested in the September 2016 scoping mission was regulation reform for the Bhutan Electricity Authority (BEA) (the national regulator). Accordingly, the MoEA requested USAID, SARI/EI, and USEA to sponsor two of the Bhutan Electricity Authority staff to attend this well-regarded regulatory training.

June 19-23, 2017, Bhutan - Training on Best Practices in Tariff Calculation: USEA organized a five-day training for Bhutan’s power sector on tariff calculation. USEA contracted the National Regulatory Research Institute (NRRI) to provide the short-term technical assistance to executives from the Bhutan Energy Authority (BEA) – the country’s regulator, Druk Green Power Corporation, Bhutan Power Corporation, MoEA-DHPS, MoEA-Department of Renewable Energy. The participants examined current best practices in tariff calculation, incorporating the necessary current policies and power sector features of the Bhutanese scenario.

July-August & September 2017, Bhutan – Hydropower Project Planning Training: At the request of the MoEA-DHPS, USEA provided a two-module training, each module were five days in duration. The training emphasized hydropower planning skills and knowledge. Approximately 20 executives from the DHPS, Druk Green Power Corporation Limited, the Department of Renewable Energy, Bhutan Power Corporation Limited, and Bhutan Electricity Authority participated. USEA contracted GE India to provide the training.

August 28-September 1, 2017, Vietnam - Executive Exchange on Hydropower Development in Vietnam: USEA organized a five-day executive exchange for Nepal members of parliament residing in provinces with planned large hydro facilities, and executives from the IBN, which is the lead organization in large hydropower development. Vietnam shared their experiences in the planning, appraisal, financing, development, risk mitigation, structuring, and operations involved in large hydropower production.

December 11-15, 2017, Sydney and Canberra, Australia - Executive Exchange on Energy Markets: Ten high-level officials from Bhutan and India participated in an executive exchange to Sydney, Canberra, and the Snowy Mountains, Australia to learn about Australia’s energy markets and how they are using hydroelectricity to balance intermittent renewables, such as wind and solar. The five-day visit included meetings with officials from the Australian Energy Market Operator, the Department of Environment and Energy, Origin Energy, AGL Energy, Delta, and a site visit to the Snowy Mountain Hydro Scheme. The goal of this executive exchange was for the delegation to learn about the creation and operation of Australia’s National Energy Market (NEM) and its plans for greater renewable energy integration and energy storage onto the grid.

April 16-20, 2018, Bangkok, Thailand - Designing, Managing, and Operating a Power Trading Entity: Eight energy executives from Pakistan participated in training on the design, management and operation of a power trading entity. The training was conducted the International Faculty of Energy (IFE). The topics covered include the best practices in electricity markets, regulatory and economic policy, and the roles of different entities in power trading. These topics were tailored to the Central Power Purchasing Authority Guarantee Limited (CPPA-G) (the newly formed power trading entity separated from the NTDC), as well as participation from the Ministry of Energy (Power Division) (MoE-PD) and the National Electric Power Regulatory Authority (NEPRA). The purpose of this training was to address the critical issues in Pakistan’s emerging energy market by enhancing the institutional knowledge and human capital of delegates from the CPPA-G, MoE-PD, and NEPRA.

August 30-31, 2018, New Delhi, India - USEA attendance at the “Regional Conference on Enhancing Energy Cooperation & Integration in South Asia”: At the request of USAID/India, USEA attended the conference organized by IRADe. The conference gave USEA the opportunity to liaison with key stakeholders of the SARI/EI program from around the region, as well as members of the SARI/EI steering committee and task forces. This liaison time

was crucial, given USEA will continue to be an implementing partner in the next phase of SARI/EI.

September 2018, New Delhi, India - USEA release of “Linking South Asia with Burma & Southeast Asia to Advance Cross Border Electricity Trade: A Political Economy Study: At the request of USAID/India and the SARI/EI Project Steering Committee, USEA contracted Deloitte India to draft a “Linking South Asia with Burma & Southeast Asia to Advance Cross Border Electricity Trade: A Political Economy Study.” The report, which attempts to identify the political, economic, and institutional considerations in South Asia that need to be resolved if the prospects of cross border energy trade are to be improved. The 113-page study was released on August 31, 2018 at the Regional Conference on Enhancing Energy Cooperation & Integration in South Asia, held in New Delhi.

SOUTHERN AFRICA POWER POOL (SAPP) PARTNERSHIP:

SAPP is a cooperation of the national electricity companies in Southern Africa under the auspices of the Southern African Development Community (SADC). The members of SAPP have created a common power grid between their countries and a common market for electricity in the SADC region. SAPP was founded in 1995.

Through funding from USAID/Southern African Region, USEA began a partnership with the SAPP. The objective of the partnership is to build capacity among senior representatives from SAPP country utilities and its member sub-committees and working groups through executive exchanges with U.S. and international utilities to expose them to worldwide best practices in energy trading and operations. The USEA – SAPP partnership encompasses executive exchanges focusing on energy efficiency, ancillary markets and transmission pricing.

Under the SAPP Partnership, the following activities took place:

July 28–August 4, 2012, Boston, Massachusetts and San Francisco, California, U.S. – Executive Exchange on Energy Efficiency and DSM: The first activity under the SAPP Partnership; participants included the members of the SAPP DSM Working Group; the focus of the executive exchange was to examine the economic and environmental benefits of energy efficiency enhancement, best practices in energy efficiency in building and other end-use best practices, methods of efficiency improvement in generation, and corresponding policies to foster conservation and energy efficiency.



Figure 4 SAPP delegates visit a solar PV rooftop facility at PG&E’s Pacific Energy Center.

February 23-March 2, 2013, Washington, D.C.; Pennsylvania; New York; Georgia, U.S. - Executive Exchange on Developing an Ancillary Service Market: The second activity under the SAPP Partnership with the members of the SAPP Markets Subcommittee; the purpose of the executive exchange was to examine the standards and trends used in the U.S. in the area to develop balancing ancillary service markets as well as gaining a better understanding of the progression of U.S power pools to independent system operators.

July 20-27, 2013, Leipzig and Cologne, Germany - Executive Exchange on Transmission Pricing, Germany: final activity under the SAPP Partnership for members of the SAPP member utilities: The purpose of the executive exchange was to examine the transmission pricing methodologies being used in international energy markets while gaining a better understanding of transmission wheeling and loss pricing practices in advanced electricity markets. Company meetings were held with Tennet TSO GmbH, EON, RWE Supply and Trading GmbH, Siemens, Bundeskartellamt, the European Commodity Clearing, and the European Energy Exchange AG. Additionally, the participants reviewed the energy trading platforms being utilized as well as the role of renewable energy to the overall generation mix.

1.1.2 TASK 1: OTHER RESULTS

Support for USAID’s Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) Initiative: USEA supported the implementation of activities for USAID’s EC-LEDS program. USEA will continue to provide logistical and technical support to the EC-LEDS program by organizing executive exchanges, workshops and training programs. EC-LEDS is a U.S. government program to support developing countries’ efforts to pursue long-term, transformative development and accelerate sustainable, climate-resilient economic growth while slowing the growth of greenhouse gas emissions. EC-LEDS supports and enhances country-led development programs, plans, and policies, and it complements efforts of other international donors and organizations to support LEDES by (1) providing targeted technical assistance for LEDES development and implementation and (2) building a shared global knowledge base on LEDES.

1.2 TASK 2: ESTABLISH AND IMPLEMENT THE UTILITY ATTACHMENT PROGRAM

- 15-20 USAID-assisted country utility staff will be provided with four to six weeks of on-the-job training and job shadowing at U.S. and other country utilities;
- Identify USAID-assisted country energy utilities interested in attachments;
- Identify U.S. or other country energy utilities willing to receive attachments;
- Arrange Work Plans and logistics for attachments; and
- Launch, monitor, and closeout attachments.

1.2.1 TASK 2: RESULTS – UTILITY ATTACHMENTS

In collaboration with, and agreement by, the USAID Energy Team Contract Officer, it was decided that USEA would not implement this task due to the lack of interest by U.S. utilities in hosting overseas utility staff for extended periods.

1.3 TASK 3: ARRANGE FOR ONE PARTNERSHIP IMPACT ASSESSMENT

- Prepare an outline for one Impact Assessment; and
- Enter into a sub-agreement with relevant company for the purpose of preparing and conducting an Impact Assessment to be undertaken in the 2nd program year. This activity was delayed and unfortunately was not conducted.

1.3.1 TASK 3: RESULTS – PARTNERSHIP IMPACT ASSESSMENT

USEA performed a partnership impact assessment for the two Jordanian utility partnerships. In addition to the performance indicators, USEA conducted general and detailed assessments to determine both participants' satisfaction with the partnerships and results obtained in part or fully due to the partnerships. Jordanian participants were asked to identify their overall level of satisfaction with their partnership and its outcomes. The responses were very positive, indicating a high level of overall satisfaction. All participants indicated that they were either completely satisfied or mostly satisfied with the partnership experience and wanted the program to continue.

The assessments listed a broad range of potential results in each work plan topic. Participants indicated whether the partnership assisted them in the various issues and were encouraged to list specific results. All three distribution utilities stated the partnership improved their understanding of regulation, energy efficiency programs and connecting renewable energy to their distribution networks. As regulation is a relatively new development in the Jordanian energy sector, the participants found the discussions on interactions with the regulators, rate making and customer dispute resolution to be particularly valuable.

Participants from IDECO and EDCO also noted the partnership has greatly assisted their utilities in improving system performance through enhanced maintenance planning, operation procedures and system protection schemes. EDCO and IDECO cited improved reliability and power quality through updating and installing equipment, improving distribution performance standards and improving maintenance practices to reduce unscheduled outages. IDECO also mentioned improved system operational performance through improved outage management systems, installation of more efficient transformers and better power system management procedures, such as calculating voltage drops. Both IDECO and EDCO also improved plans for handling voltage issues, such as overloading, to enhance system protection. All three utilities received critical information on live line maintenance that greatly improved their procedures and increased worker safety. Other maintenance improvements as a result of the partnership were improved maintenance manuals and procedures, such as reliability centered maintenance.

Additional information on the impact assessment conducted for JUPP is included in the **JUPP Final Report (2009-2012)** and is made part of this report as **Annex B**.

1.4 TASK 4: INFORMATION DISSEMINATION AND NON-PARTNERSHIP WORKSHOPS AND CONFERENCE SUPPORT

Under the EUPP cooperative agreement, USEA undertook the following activities related to information dissemination and non-partnership workshop and conference support:

- Prepare and disseminate reports on partnership activities;
- Prepare summaries of results and distribute;
- Prepare and disseminate brochures on EUPP, Utility Attachments, and “Success Stories”;
- Organize or assist in organizing USAID-designated workshops/conferences; and

- Conduct information dissemination activities and provide non-partnership workshop and conference support.

I.4.1 TASK 4: RESULTS – INFORMATION DISSEMINATION

USEA proudly reported on Program activities on a regular basis. We established a webpage for EUPP which can be viewed at <https://www.usea.org/program/energy-utility-partnership-program-eupp>. We continuously update the webpage to relate the most recent and relevant information on EUPP and relevant energy sector topics, to provide information on upcoming events, and to act as a repository for presentations and other materials from past EUPP programs. We also include articles and member briefings by international delegates as appropriate. In addition, we provide regular email updates to a mailing list of over 3,000 subscribers and interested parties.

I.4.2 TASK 4: Results – Non-partnership Workshops and Conference Support

Through EUPP, USEA conducted workshops and hosted the participation of delegates at both domestic and international workshops, conferences, and programs.

GLOBAL WORKSHOPS:

The Global Workshops were a capacity building program designed to improve the technical and policy skills of professional staff in EUPP utilities, regulators and policymakers. The workshops assisted participants in examining policy and regulatory issues, technology and market development that will improve investment and energy security in the EUPP respective countries and regions. Under EUPP, USEA conducted five (5) global workshops on various topics as detailed below.

The following global workshops were facilitated under EUPP:

August 31 - September 4, 2009, Washington, D.C., United States - Global Workshop On Grid Connected Renewable Energy: The workshop brought together key energy officials from eight developing countries, the European Union, and the United States to discuss the role of renewable energy in meeting today’s energy demand and the methodologies and policies required to bring these resources efficiently and competitively to consumers. The objective of the workshop was to discuss how utilities can successfully integrate intermittent generation sources. Participants gained an understanding of how electric utilities are mitigating the issue of intermittency from renewable resources through creating a more flexible system. The workshop focused on the following topics:

- Increasing System Flexibility through Generation;
- GTG;
- Flexible Demand;
- Energy Management Systems;
- The Value of Forecasting to Ensure System Flexibility;
- Operational Challenges with Variable Resources;
- Developing Smart Grid to Increase System Flexibility;
- Storage Options to Improve Grid Reliability and Flexibility; and

- Smart Grid.

March 6-13, 2010, Washington, D.C., United States - Global Workshop On Energy Efficiency: The Global Energy Efficiency Workshop brought together key energy industry officials from ten USAID-assisted countries and the United States to discuss the ever-growing role of energy efficiency in meeting today's energy demand and the methodologies and policies required to effectively promote energy efficiency to end users to offset energy demand, decrease the need for new generation construction and lower the global carbon footprint. The workshop included four days of presentations, a session where each country presented their current renewable energy outlook, and a day of site visits to facilities within the metropolitan D.C. area that are energy efficient or promote energy efficiency to consumers.

The objective of the workshop was to inform and motivate leaders in business, government, and utilities, and the public and private sectors in USAID-assisted countries to implement energy efficiency, energy conservation, and demand-side management programs in their countries. This workshop assisted the participants in understanding the role of energy efficiency, energy conservation, and demand-side management tools to meet the growing demand for energy services while meeting the ever stringent financial, environmental and reliability requirements.

February 26, 2011 - March 5, 2011, Washington, D.C., United States - The Global Workshop on Low Carbon Power Sector Development: This workshop focused on how utilities are integrating low carbon generation resources into their systems given financial constraints. This was a four and a half day workshop and included site visits. Participants gained an understanding of the integrated resource planning process used by electric utilities to plan supply and demand resources to meet future capacity needs for their customers. In particular, they looked at the following low carbon generation options:

- Renewable energy;
- Energy efficiency;
- Energy conservation;
- DSM;
- Nuclear;
- Fuel switching; and
- Carbon capture and storage from fossil resources.



Figure 5 Sharon Hsu, Energy Team Coordinator at USAID's Bureau for Economic Growth and Trade, & Dr. Katherine "Kit" Batten, USAID Climate Change Coordinator, opened USEA/USAID's Workshop on Low Carbon Power Sector Development. Participants in this program hailed from Georgia, India, Indonesia, Kazakhstan, Mexico, the Philippines & South Africa.

December 10-17, 2011, Washington, D.C., U.S. - The Global Workshop on Low Carbon Power Sector: Nine representatives from five countries participated in the workshop. This was a follow-up to the earlier low carbon workshop held in March 2011. The objective of the workshop was to inform and motivate leaders in business, government, and utilities, and the public and private sectors in USAID-assisted countries to implement low carbon power generation plans. In particular, the workshop examined the following low carbon generation options:

- Energy conservation initiatives;
- DSM;
- Technology;
- Nuclear;

- Project financing;
- Integrated resource planning;
- Carbon capture and storage from fossil resources; and
- Integration of renewable energy facilities in to the grid.

December 1-8, 2012, Washington, D.C. - Global Clean Energy Workshop Series: Global Workshop on Clean Energy Development: Establishing a Foundation for Low Carbon Energy Systems: Senior energy executives from Colombia, Dominican Republic, El Salvador, Ghana, Indonesia, Mexico, and South Africa participated in a workshop focused on how utilities regulators, and government agencies can best integrate low carbon generation resources into their systems for clean energy development given financial constraints. Participants and speakers discussed the integrated resource planning process used by electric utilities to plan capacity resources to meet future customer demand. Delegates learned how to formulate plans to address the growing demand for energy services while meeting the ever stringent financial, environmental and reliability requirements.

REGIONAL WORKSHOPS:

Under EUPP, USEA developed and facilitated seven regional workshops. The regional workshops were held to allow a greater audience to come together to discuss regional issues and focus on best practices to address the various issues. Presenters were brought in from the U.S. and the region to present the key issues currently being addressed in the energy industry worldwide. Under EUPP, USEA conducted 8 regional workshops as follows:

July 16-18, 2012, Arusha, Tanzania - Regional Workshop on Clean Energy Development Strategies in East Africa: Clean Energy Workshop Series: The Workshop on Clean Energy Development Strategies in East Africa was conducted in cooperation with the East African Community Secretariat. It focused on how utilities, regulators, and government agencies implement best practices for clean energy development. The workshop lasted two and a half days including site visits to biogas plants developed by the Tanzania Domestic Biogas Program. Participants and speakers discussed the integrated resource planning process used by electric utilities to plan supply and demand resources to meet future capacity needs for their customers. In particular, they focused on the following strategies for clean energy development: renewable energy integration, utility energy efficiency programs and DSM, rural electrification and regional interconnections. This workshop assisted participants in formulating plans to address the growing demand for energy services in their home countries while meeting the ever stringent financial, environmental and reliability requirements. This program included participants from Burundi, Kenya, Rwanda, Tanzania and Uganda.



Figure 6 Participants of the Regional Workshop on Clean Energy Development Strategies in East Africa held in Arusha, Tanzania in July 2012.

July 15-19, 2013, Latin America - Regional Workshop on Clean Energy Development Strategies in Latin America: Senior energy executives from Colombia, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Panama and Peru participated in a workshop focused on how utilities can best integrate low carbon generation resources into their systems given financial constraints.

October 7-11, 2013 - Reducing Power Outages & Improving Electric Services: A Regional Workshop for Distribution Utilities: Senior distribution executives from Ethiopia, Ghana, Kenya, Liberia, Nigeria, Tanzania and Uganda participated in a regional workshop focusing on distribution utility improvement. Participants met with their peers from third country utilities and U.S. experts to learn about technologies and techniques for improving distribution utility performance, strategies and approaches on how best to integrate smart grid technologies and customer information systems, in addition to incentives for, and technical challenges to, the implementation of advanced meters and smart grid. The workshop highlighted three important topics: including distribution system management and reliability; metering and revenue enhancement; and customer service improvement.

September 15-18, 2014, Tanzania - Metering, Billing and Loss Reduction: a Regional Workshop for Municipal and Distribution Utilities: Senior representatives from distribution utilities in the DRC, Ghana, India, Kenya, Mozambique, Nigeria, the Philippines, South Africa, Swaziland, Tanzania and Uganda recently participated in a USAID funded regional workshop focusing on metering, billing and loss reduction programs and strategies. The utilities were joined by representatives from regulatory agencies in Kenya and Tanzania, the MoF in Tanzania and the African Development Bank. Participants met with their peers from third country utilities as well as U.S. and global experts to learn about technologies and techniques for reducing technical and non-technical losses in distribution networks, strategies and approaches on how best to integrate smart grid technologies and customer information systems, best practices in customer engagement and community outreach, how to engage and incent utility employees to implement loss reduction practices, and what financing mechanisms are available for implementation of advanced meters and smart grid systems.

November 2-5, 2015, Johannesburg, South Africa - Metering, Billing, and Loss Reduction: a Regional Workshop for Municipal and Distribution Utilities: Senior utility executives, regulators and ministry officials from more than twenty companies and organizations participated in a regional workshop that focused on improving distribution utility performance and solvency. Participants from Botswana, Namibia, Lesotho, Philippines, South Africa, Swaziland and the United States met with their peers from utilities, meter and software manufacturers, and financial institutions to learn about strategies, technologies and techniques for improving distribution utility performance. The participants discussed a range of issues, including strategies for reducing technical losses, combatting electricity pilferage and meter tampering and how best to integrate smart grid infrastructure, new information and data analysis technologies and advanced meters.

June 11-12, 2015, Bangkok, Thailand - Workshop on Renewable Energy Integration in Asia – Increasing System Flexibility to Mitigate Intermittent Resources: The objective of the workshop was to discuss how utilities can successfully integrate intermittent generation sources. Participants gained an understanding of how electric utilities are mitigating the issue of intermittency from renewable resources through creating a more flexible system. The workshop focused on the following topics:

- Increasing System Flexibility through Generation;
- GTG;
- Flexible Demand;
- Energy Management Systems;
- The Value of Forecasting to Ensure System Flexibility;
- Operational Challenges with Variable Resources;
- Developing Smart Grid to Increase System Flexibility;
- Storage Options to Improve Grid Reliability and Flexibility; and
- Smart Grids.

In particular, they discussed: flexible generation, variable generation integration analysis, intermittent resource impacts on the system and how to build a more flexible system to address them, frequency response, system balancing, and energy storage. This workshop assisted participants in formulating plans to successfully operate ever increasing amounts of intermittent generation in their grids by building a more flexible grid. This program was targeted toward utility planners, operators and dispatchers.

January 25-27, 2016, Mexico City, Mexico - Workshop on Advancing the Use of Wind and Solar Forecasting to Facilitate the Integration of Variable Renewable Energy to the Grid: Latin America: System operators from nine different countries in Latin America and the Caribbean participated in a regional workshop that focused on wind and solar forecasting. Participants were given the opportunity to engage with experts on meteorological forecasting and operational methods for integrating renewable energy into their electricity grid. This program was targeted toward system operators from the following countries: Mexico, Nicaragua, Panama, Jamaica, Costa Rica, Guatemala, Honduras, Colombia and El Salvador. Ente Operador Regional (EOR), El Salvador's Regional Operator Entity, also had representatives at the workshop.

SUPPORTED WORKSHOPS:

USEA provided support to WIREC, a global platform for government, private-sector, and nongovernmental leaders to jointly address the goal of advancing renewable energy. USEA also assisted in sponsoring individuals from Nepal and Afghanistan to attend WIREC.

March 4-6, 2008 - Washington, D.C., U.S. – WIREC 2008: EUPP sponsored the participation of Mr. Sundar Bajgain, Head of Biogas Programs in Bangladesh to make a presentation at WIREC. WIREC brought together government, civil society, and private business leaders to address the benefits and costs of major and rapid scale-up in the global development of renewable energy technology. Hosted by the United States Government, WIREC 2008 was the third global ministerial-level conference on renewable energy, following events in Beijing in 2005 and Bonn in 2004.

SPONSORED DELEGATES TO WORKSHOPS/CONFERENCES:

In an effort to support the participation of delegates from USAID-assisted countries to attend relevant workshops and conferences, EUPP sponsored individuals' travel expenses. The following sponsorships took place under EUPP:

December 26, 2008 through January 9, 2009, Morocco – Harvard Business School – Energy Studies Program: Students from the Harvard Business School Energy Studies Program assisted USAID/Morocco in the development of a financial model and provided analysis for the feasibility of a small/medium scale grid-connected renewable project for the Government of Morocco – National Agency for Renewable Energy (CDER). At the end of the program, the business students made a presentation on “Developing a Moroccan CleanTech Cluster” as well as writing a detailed report of their findings that will be used by the Government of Morocco.

December 26, 2008 – January 9, 2009, Philippines - Harvard Business School – Energy Studies Program: A MoU was signed between the DoE and Winrock International (AMORE) to design, development, and implement three micro-hydro projects (MHP) in various regions of the Philippines. USEA sponsored the travel of three Harvard Business School students to travel to the Philippines to assist USAID/Philippines and AMORE to develop a business planning study to determine the sustainability of the MHP's.

October 2010, Morocco - Harvard Business School – Energy Studies Program: USEA sponsored the travel of three Harvard Business School students to travel to Morocco to participate in the Global Impact Experience.

November 10-17, 2014, U.S. - Executive Exchange: Renewable Energy Grid Integration in the United States for the Indian Power Sector: The objectives of this executive exchange included providing an opportunity for the participating delegates to learn about diverse experiences in the United States on integrating large amounts of variable renewable energy to the grid, and seek ideas and feedback from U.S. experts on how India can meet its own renewable energy targets. The delegation also identified areas of collaboration between the U.S. and India on grid integration of renewable energy.

May 2017, Houston, TX – USEA sponsored two delegates from TPDC to the 2017 OTC.

SPONSORED CONSULTANTS/MEETINGS

USEA supported Nigel Wills to develop a concept paper on rural electrification in Southern Sudan for the Southern Sudan Infrastructure Services Project.

April 2010, Abuja, Nigeria - Supported Mr. Jeff Cohen of Troutman Sanders and Mr. Jason Czyz to travel to Abuja, Nigeria to conduct meetings with various representatives of the Government of Nigeria: The purpose of the meetings was to provide technical assistance in reviewing the Petroleum Industry Bill (PIB) from an international perspective. After review of the PIB, recommendations were then made to the Government of Nigeria on ways in which it could be revised and approved. Recommendations of further evaluation and coordination of assistance among those invested were also discussed.

August 2010, Abuja, Nigeria – Supported Mr. Jeff Cohen of Troutman Sanders and Mr. Jason Czyz: Mr. Cohen and Mr Czyz traveled to Abuja, Nigeria for follow-up meetings to continue discussions that were initiated in April 2010 with the various Government of Nigeria entities.

2. RESULTS, SUB-RESULTS, AND TARGETS FOR ALL INDICATORS BY COUNTRY

2.1 IMPACTS AND INDICATORS

Under EUPP, USEA was required to meet specific indicators for planned activities undertaken during the term of EUPP. We provide below the Impact and Indicator Table with indicator totals provided for all activities under EUPP and for the entire performance period for this Program. We also include cost share totals below the **Comprehensive Indicator Tables** that show totals for each year by country are included with this report in **Annex C**.

EUPP INDICATOR TOTALS 2008-2018

AFRICA		
Indicators 2008-2016		
	Totals	
Increase the number of best practices implemented by overseas energy utilities	7	
Increase number of documents transferred	171	
Number of people trained in Energy Policy and Regulatory Practices (energy related)	944	
Increase number of new energy market procedures introduced	7	
Increase number of new policies or procedures implemented by energy utilities to increase consumer participation and satisfaction	6	
Increase number of energy enterprises with improved greenhouse gas mitigations	36	
E3 Impacts and Performance Indicators & GCC Indicators 2008-2016		
	Totals	
Number of people trained in Energy Policy & Regulatory Practices	111/21	*male/female
Number of people trained in Energy Technical Fields	331/31	*male/female
Number of people trained in Business Management Systems (energy related)	94/25	*male/female
Number of energy enterprises with improved business operations	73	
Number of institutions with improved capacity to address climate change issues (clean energy) as a result of USG assistance	94	
Number of stakeholders with increased capacity to adapt to the impacts of climate change as a result of USG assistance	76	
Number of people receiving training in global climate change as a result of USG assistance	278	
Number of days of USG funded technical assistance in climate change provided to counterparts or stakeholders	748	
Power Africa Indicators 2008-2018		
	Totals	
14 – Person hours of training completed in technical energy fields supported by USG assistance	14,947	

19 – Number of policy reforms/laws/regulations/administrative procedures drafted and presented for public/stakeholder consultation to enhance sector governance and/or facilitate private sector participation and competitive markets as a result of USG assistance	10
--	----

ASIA	
Indicators 2008-2016	
	Totals
Increase the number of best practices implemented by overseas energy utilities	24
Increase number of documents transferred	307
Number of people trained in Energy Policy and Regulatory Practices (energy related)	329
Increase number of new energy market procedures introduced	15
Increase number of new policies or procedures implemented by energy utilities to increase consumer participation and satisfaction	9
Increase number of energy enterprises with improved greenhouse gas mitigations	22
E3 Impacts and Performance Indicators & GCC Indicators 2008-2018	
	Totals
Number of people trained in Energy Policy & Regulatory Practices	288/22
Number of people trained in Energy Technical Fields	230/16
Number of people trained in Business Management Systems (energy related)	143/7
Number of energy enterprises with improved business operations	42
4.8.2-14: Number of institutions with improved capacity to address climate change issues (clean energy) as a result of USG assistance	261
4.8.2-26: Number of stakeholders with increased capacity to adapt to the impacts of climate change as a result of USG assistance	510
4.8.2-6: Number of people receiving training in global climate change as a result of USG assistance	524
4.8.2-10: Amount of investment mobilized (in USG) for climate change as supported by USG assistance	
4.8.2-27: Number of days of USG funded technical assistance in climate change provided to counterparts or stakeholders	607
Power Africa Impacts & Performance Indicators 2008-2018	
	Totals
Number of policy reforms/regulations/administrative procedures drafted and presented for public/stakeholder consultation to enhance sector governance and/or facilitate private sector participation and competitive markets	1
Person hours of training completed in technical energy fields supported by USG assistance	0

OTHER	
indicators 2008-2016	
	Total for 2008-2016

Increase the number of best practices implemented by overseas energy utilities	24	
Increase number of documents transferred	593	
Number of people trained in Energy Policy and Regulatory Practices (energy related)	559	
Increase number of new energy market procedures introduced	21	
Increase number of new policies or procedures implemented by energy utilities to increase consumer participation and satisfaction	5	
Increase number of energy enterprises with improved greenhouse gas mitigations	8	
E3 Impacts and Performance Indicators & GCC Indicators 2008-2018		
	Total for 2008-2018	
Number of people trained in Energy Policy & Regulatory Practices	571/108	*male/female
Number of people trained in Energy Technical Fields	468/86	*male/female
Number of people trained in Business Management Systems (energy related)	509/94	*male/female
Number of energy enterprises with improved business operations	80	
4.8.2-14: Number of institutions with improved capacity to address climate change issues (clean energy) as a result of USG assistance	130	
4.8.2-26: Number of stakeholders with increased capacity to adapt to the impacts of climate change as a result of USG assistance	151	
4.8.2-6: Number of people receiving training in global climate change as a result of USG assistance	182	
4.8.2-10: Amount of investment mobilized (in USG) for climate change as supported by USG assistance	13	
4.8.2-27: Number of days of USG funded technical assistance in climate change provided to counterparts or stakeholders	17	
Power Africa Impacts & Performance Indicators 2008-2018		
	Total for 2008-2016	
Number of policy reforms/regulations/ administrative procedures drafted and presented for public/stakeholder consultation to enhance sector governance and/or facilitate private sector participation and competitive markets	0	
Person hours of training completed in technical energy fields supported by USG assistance	0	

2.2 EUPP COST SHARE TOTALS 2008-2018

AFRICA	
Cost Shares Leveraged:	TOTALS
Private Business	\$656,377
Private Philanthropy	\$0
Other Private Organization	\$58,500
NGO	\$29,990

Higher Education Institution	\$0
Recipient Country Government	\$1,233,260
Bilateral/ Multilateral Donor	\$15,875
Other Non-U.S. Government	\$111,375
U.S. Government	\$161,375
Cumulative Cost Share 2008-2016	\$5,314,575
Total Cost Share Amount	\$7,581,327

ASIA FY2017-2018	
Cost Shares Leveraged:	TOTAL
Private Business	\$185,849
Private Philanthropy	\$0
Other Private Organization	\$57,000
NGO	\$92,360
Higher Education Institution	\$39,366
Recipient Country Government	\$750,154
Bilateral/ Multilateral Donor	\$18,750
Other Non-U.S. Government	\$92,302
U.S. Government	\$124,991
Cumulative Cost Shares 2008-2016	\$1,545,373
Total Cost Share Amount	\$2,906,145

OTHER	
Cost Shares Leveraged:	TOTAL
Private Business	\$297,375
Private Philanthropy	\$0
Other Private Organization	\$3,250
NGO	\$78,625
Higher Education Institution	\$11,500
Recipient Country Government	\$190,925
Bilateral/ Multilateral Donor	\$42,875
Other Non-U.S. Government	\$0
U.S. Government	\$66,000
Cumulative 2008-2016	\$3,135,235
Total Cost Share Amount	\$3,825,785

3 KEY ACCOMPLISHMENTS AND SUCCESSES

3.1 PROMOTING U.S. EXPERTISE IN DEVELOPING MARKETS

As the world's population approaches 9 billion people in 2040, we are challenged to help improve living standards everywhere. We expect that progress will be powered by human ingenuity and the energy that helps make better lives possible.

Meeting energy demand safely, reliably and affordably – while also minimizing risks and environmental impacts – will require expanded trade and investment. It will require innovation and advanced technology. And it will require practical and robust solutions to meet the wide-ranging needs of individuals, businesses and governments.

Providing an understanding of the factors that drive the world's energy needs – and likely solutions to meet those needs – was part of the mission of EUPP. By sharing best practices and lessons learned, EUPP aimed to broaden the understanding among individuals, businesses, and governments. Some of the key accomplishments and successes in this area included:

3.1.1 Djibouti: Djibouti is a geopolitically important partner to the U.S., as it hosts the largest U.S. military installments in Africa. However, the domestic power sector faces shortages and high power prices of over \$0.32/kWh. Geothermal energy is regarded as a cost-effective solution to Djibouti's electricity woes, however, no geothermal power generation projects have yet been commissioned. Realizing the threat to U.S. interests posed by power shortages in Djibouti, USEA engaged in a partnership with USAID and the ODDEG. USEA hired a U.S. company, Capuano Engineering, to provide drilling supervision services to ODDEG during the Government of Djibouti's first ever geothermal drilling program. The drilling program was successful on its first well and could provide up to 10% of the country's electricity demand.

3.1.2 Ethiopia: As a result of USEA activities on smart meters and smart grid technologies, dVentus (a U.S. company) was hired by EEU to install a smart meter pilot project in Addis Ababa, Ethiopia around Bole sub city. dVentus deployed and tested smart electric meters for the EEU along with the communication and back office meter data management and grid monitoring system. The pilot was the first step toward EEU implementing smart meters which would improve revenue and decrease losses.

3.1.3 Kenya: In 2017-2018, KPLC directly hired a U.S. company IncSys to continue dispatch training that began under EUPP. IncSys and PowerData, another U.S. firm, provided the PowerSimulator software hosted on the cloud with the KPLC specific model. KPLC has a lease to use the software for one year with a plan to renew. IncSys also provided training on how to use PowerSimulator with the KPLC system specific model. The contract value for IncSys was valued around \$50,000. This relationship and training was still ongoing in FY2018. The continued training of dispatchers will improve reliability and allow more renewables to be integrated onto the grid.

3.1.4 East Africa Geothermal: Through the EAGP-sponsored exchange program to the GEA Expo and GRC Annual Meeting, Ethiopian and Kenyan geothermal officials made contacts with over 70 U.S. firms that supply many of their needed goods and services.

EAGP delegates and their senior colleagues in attendance were able to generate new interest in the EA geothermal market among a larger audience of U.S. companies, through presentations on opportunities and procurement needs in EA (organized by EAGP and GEA). The successful event has resulted in a plan to engage U.S. industry members to give feedback on GDC's, and possibly KenGen's, tender design. This will improve GDC's ability to execute transactions related to their goods and services tenders.

3.1.5 East Africa Geothermal: The EAGP Partnership supported the World Bank and GoK's "Geothermal Strategy Consultation Forum". The Forum convened decision-makers from the GoK, including the cabinet secretary and permanent secretary of the Ministry of Energy and Petroleum, the CEOs of both KenGen and the GDC, World Bank officials, along with local and international private sector experts to evaluate Kenya's progress in geothermal, identify barriers to accelerating development, and provide input to a new national geothermal strategy under development with World Bank. The two-day forum brought together about 200 people for a conversation about how to maximize private sector investment while leveraging the skills of parastatal companies like GDC and KenGen. Overwhelmingly, the audience recommended pursuing PPPs and finding ways to mitigate early-stage development risk. The feedback was well-received by the Kenyan institutions, who face the challenge of unbalanced budget sheets and restrictions on capital expenditures. The World Bank incorporated the feedback from the forum into the development of the National Geothermal Strategy.

3.1.6 Nigeria: Itron held discussions to supply commercial and industry electricity meters to Nigerian distribution utilities based in Benin City and Eko (Lagos). The value of these initial deals was estimated at \$378,000 with a second order estimated at \$2,637,000 pending. Itron attributed these sales as direct results of the interactions with Nigerian distribution utility executives during the distribution utility training workshop USEA organized. Actual value of the sale of the goods was hard to verify from the distribution utilities.

3.1.7 East Africa Geothermal: The *Ethiopia Geothermal Resources Development Proclamation (GRDP)* was developed. In Ethiopia, the potential for geothermal development exceeds 5,000 MWs. However, after over 30 years of exploration, only 7 MWs have been developed. In 2014, over 1,000 MWs of private sector geothermal projects were on hold due to a lack of legal, regulatory, and licensing structure. These projects, worth over \$5B, could not move forward without a framework for development. Responding to this, USEA, through EAGP, provided technical and legal experts to assist the GoE in the development of the GRDP. GRDP is the first legal framework for geothermal development in Ethiopia's history and only the second geothermal legal framework on the African continent. It established the regulatory bodies and licensing procedures for geothermal development and unlocked the door for over \$4B of U.S. projects to move forward in Ethiopia.

3.2 EXPANDING REGIONAL AND GLOBAL COOPERATION

Regional and global cooperation is necessary in order to meet the world's growing energy demands. Cooperation includes coordinated and joint action in policy areas that strengthen the potential for growth and structural change in developing countries, including macroeconomic,

financial, infrastructure and industrial policies. Regional cooperation between developing countries to pool efforts in such areas as energy, water supply, research and development, and knowledge generation can be crucial for the success of development strategies. This cooperation can also strengthen the potential for growth and structural change leading to more broad-based and sophisticated economic activity. Increasing the opportunities for regional and global cooperation formed the very foundation of all of the work under EUPP. Some of the key accomplishments and successes in this area included:

3.2.1 South Asia Regional Initiative for Energy (SARI/E): Prior to USAID’s SARI/EI program, the only cross-border electricity exchange in the South Asia region was between India and Bhutan. Since then, interconnections have been established between Nepal and India, Bangladesh and India, and expanded between Bhutan and India. Today, there is momentum behind a trilateral interconnection between Bhutan-Bangladesh-India and Nepal-India-Bangladesh, as well discussion of regional energy trade between South Asia and Southeast Asia.

The South Asia Regional Initiative for Energy was launched in 2000, with the goal of promoting energy security through energy cooperation and integration in South Asia. In its first phase, SARI/EI focused mainly on advocacy activities designed to demonstrate to a skeptical audience the advantages of regional cooperation in energy in the form of information exchange and sharing of best practices. Once the benefits of regional cooperation were established, activities dealt primarily with building consensus among regional actors on energy requirements and identifying avenues for collaboration. The final phase under EUPP focused on creating the institutional capacity, the policy/regulatory framework and national energy markets required for regional energy integration.

Having just finished its fourth phase in September 2018, the SARI/EI program focused on advancing cross-border energy trade (CBET) through an inter-governmental consultative process.

3.2.2 Ethiopia- Kenya-Tanzania: USEA subcontracted with EKC to draft the EKT Wheeling Methodology. This methodology will determine wheeling tariff prices for energy Ethiopia sells to Tanzania and sends through Kenya. Through input given, the EKT Wheeling Methodology will be a document that may well be replicated in other regions of sub-Saharan Africa.

3.2.3 Central Africa Power Pool: As a result of a workshop in December 2008, the CAPP executive directors approved finalization of the electricity code that lays out the laws and regulations necessary to operate CAPP. The code outlines regulatory responsibilities and necessary laws to promote transmission investment in the region, operate the power pool, regulate tariffs, and facilitate energy exchange.

3.2.4 Central Africa Power Pool: The CAPP Council of Ministers, representing the Ministries of Energy in the CAPP countries, agreed to adopt – in all CAPP countries - the Electric Code drafted by PA. The code outlines regulatory

responsibilities and necessary laws to promote transmission investment in the region, operate the power pool, regulate tariffs, and facilitate energy exchange.

3.2.5 Afghanistan: Afghanistan fully participated in several partnerships formed under EUPP: SARI/IE, Central Asia, and a bilateral partnership with DABS. At the time of September 11, 2001 only approximately four percent of the Afghan population had access to electricity. By 2018, that number had increased to approximately 40%. Afghanistan's commitment to regional and global cooperation through EUPP and other programs played an important role in building their capacity to increase energy access.

3.3 BUILDING AN ENABLING ENVIRONMENT FOR U.S. DEVELOPERS

The necessary global energy investment—including both conventional and renewable energy—is estimated in excess of \$2 trillion (USD) per year through 2040.

Although the public sector will have to finance a portion of these investments, it will not have the capacity to meet the full investment needs. USAID-assisted countries will therefore need to call on the financial depth and technical know-how of private sector investors and energy companies. In order to attract these investors, countries will need to create an enabling environment that provides secure ownership rights, is subject to the rule of law, fosters transparency, and enables reasonable risk mitigation.

In addition, individual sectors will have to be viewed as financially and commercially viable. This will be particularly critical in those sectors, such as electricity and heat that are largely dependent on their domestic markets.

To that end, much of the work accomplished under EUPP was focused on building an enabling environment for U.S. developers. Some of the key accomplishments and successes in this area included:

3.3.1 East Africa Geothermal: In Ethiopia, the potential for geothermal development exceeds 5,000 MWs. However, after over 30 years of exploration, only 7 MWs have been developed. In 2014, over 1,000 MWs of private sector geothermal projects were on hold due to a lack of legal, regulatory, and licensing structure. These projects, worth over \$5B, could not move forward without a framework for development. Responding to this, USEA, through the U.S. –EAGP, provided technical and legal experts to the GoE to develop the GRDP. The GRDP is the first legal framework for geothermal development in Ethiopia's history. It established the regulatory bodies and licensing procedures for geothermal development and unlocked the door for over \$4B of U.S. projects to move forward in Ethiopia.

3.3.2 Haiti: The EUPP, in collaboration with USAID, worked with London Economics International (LEI) and the Haitian Institute for Energy (IHE) to provide technical assistance in the establishment of Haiti's newly formed regulatory agency, l'Autorité Nationale de Régulation du Secteur de l'Energie (ANARSE), in order to bolster its capacity as a newly established regulatory entity in the energy sector. The technical assistance resulted in:

- Review of the licensing definition and application across power sector activities;
- Assessment of tariff design options for Haiti and the appropriateness of performance-based ratemaking (or incentive-based ratemaking);
- Development a tariff design that encourages foreign investment;
- Definition of the roles and responsibilities of new ANARSE staff and internal departments; and
- Development of a strategic plan for the new regulatory entity, providing recommendations for its establishment and operation.

3.3.3 Engendering Utilities: In recognition of the gender gap in the power sector, USEA launched the Engendering Utilities Partnership. Many of the utilities participating in this partnership were able to create programs catered toward young women interested in science, technology, energy, mathematics (STEM), develop mentoring programs begin at the high school level, and discuss the development of policies geared toward more gender diverse hiring practices.

3.4 IMPROVING RELIABILITY THROUGH SYSTEM PLANNING AND OPERATIONS

In the U.S., we enjoy the benefits of a highly reliable electrical power system. Reliable, affordable electric power fuels the economy and supports our quality of life. Each time we turn on a light, plug in a phone, approach a traffic signal, or log onto a computer, we trust that the power system will be working to enable the services we expect. That is power system reliability: the ability of the system to deliver expected service through both planned and unplanned events.

The high level of reliability provided by the U.S. grid is not by accident. The U.S. Department of Energy, Federal Energy Regulatory Commission (FERC), North American Electric Reliability Corporation (NERC), regional planning authorities, utilities, power system operators, and other organizations work to ensure adequate reliability of the U.S. power system through implementation of reliability standards, timely planning and investment, and effective system operations and coordination.

In addition, a variety of new technologies and practices have arisen to help maintain electric system reliability. Power system operators are using these new technologies and practices to maintain a high level of grid reliability.

Many USAID-assisted countries are still facing huge challenges in improving the reliability of their power systems. EUPP sought to ensure that there were many opportunities for knowledge sharing around system reliability. Below are some of the key accomplishments and successes achieved through EUPP in this area.

3.4.1 India GTG: USEA conducted a baseline study as part of the India’s GTG System Operators Partnership program. The baseline study was drafted after a series of meetings with relevant stakeholders and system operators was held to map current procedures, tools and competencies of Indian colleagues in the dispatch centers. The consultant identified the readiness and capacity building needs of each individual system operator entity for the large-scale integration of

vRE into the power grid, along with a summary of India's system as a whole. The report included the outcomes of the baseline study scoping mission with respect to:

- Mapping of current procedures, tools and competencies;
- Identifying gaps in relation to efficient and secure integration of variable renewable energy;
- Proposal on possible development of operational procedures and tools; and
- Proposal on a capacity building program for Indian dispatch center staff.

3.4.2 SARI/IE: In August 2018, USEA released the report (drafted by subcontractor Deloitte) "Linking South Asia with Burma & Southeast Asia to Advance Cross Border Electricity Trade: A Political Economy Study. The report (which is the first of its kind) attempts to identify the political, economic, and considerations in South Asia that need to be resolved if the prospects of cross border energy trade are to be improved. The report was released in New Delhi at the Regional Conference on Enhancing Energy Cooperation & Integration in South Asia. The report also traces benefits of political support for cross-border energy trade in the South Asia region and the political support for cross border electricity trade in Burma and Southeast Asian countries

3.4.3 Kenya: USEA organized three dispatcher trainings for KETRACO, KenGen and the Electricity Regulatory Commission in Kenya with IncSys. The training courses focused on dispatch with wind generation with a heavy emphasis on simulation training. The trainings led to the discovery of several potential problems with their planned system. The discoveries took place when they practiced dispatch on the simulator of the future system that IncSys designed for them. As a result of discovering there is a lack of generation reserves at Lessos, KPLC has commissioned a second 30MW Gas Turbine unit at Muhoroni and is fast tracking a 220kV transmission line between Olkaria and Lessos to help evacuate more power and sort out the voltage issues. The skillset of the participants to handle the intermittence of renewables as the Lake Turkana Wind Farm came online also increased.

3.4.4 Rwanda: USEA subcontracted for short term technical assistance to assist the EUCL with reviewing the current status of their cross-border distribution lines and propose cost-effective measures for control of power flows – for both import and exports. The technical assistance concluded with:

- An evaluation, with recommendations, that highlighted the operational issues and challenges related to existing interconnection lines between Rwanda and neighboring countries (Uganda, DRC and Burundi); and
- An assessment of the operational readiness of the utilities to operate the planned high voltage interconnections and recommendations.

3.4.5 East Africa Transmission Planning (EATP): The EATP Working Group completed the development of East Africa's first integrated load flow planning model for the 2020 planning horizon. The model features all transmission network and generation elements for 110 kV and higher voltage

networks for Kenya, Ethiopia, Tanzania, Rwanda, Uganda and Burundi. The regional model provides the EATP and EAPP with a powerful tool to forecast system investment requirements to accelerate regional clean energy and trade. Additionally, each utility was left with a platform to analyze internal network investments needed to increase electrification in their respective country. Key results of the EATP Working Group include:

- The development of a consensus for settling national power balances (import/export) within the regional model for each country. The national power balances will form the basis of the network analysis to be completed using the 2020 load flow model.
- The initiation of a Project Tracker to determine the probability of commissioning generation and transmission projects within the planning horizon being analyzed (2020).
- The development of protocol for regularly updating the models every 6 months to keep it current and consistent with TSO network plans.
- Adoption of a Terms of Reference to conduct a sensitivity analysis of regionally significant candidate transmission investment projects using agreed upon parameters.
- One-to-one mapping to the EATP generation and transmission project tracker to correspond with the EATP Load Flow Model for target year 2020;
- The creation of an EATP Self-assessment Dynamic Modeling and Analysis Tool to enable transmission utilities to identify network planning institutional and human resource and capacity deficits and benchmark their capacity against one another, and
- The creation of a step-by-step Standard Operating Procedures Manual that outlines the planning criteria, defines strict requirements and gives directions and recommendations for construction, usage and update of the EATP regional model in load flow software.

3.4.6 Jordan: IDECO in Jordan made major advances towards standardizing its design and construction specifications for its 33 kV and 11 kV overhead and underground distribution networks. This was a critical element in its long term plans to significantly increase distribution system efficiency. With the help of SMUD's standards department, IDECO developed a standards implementation plan to systematize the utility's design, construction and warehousing processes. This standardization effort lead IDECO to invest in other tools that will facilitate further standardization.

3.4.7 Jordan: IDECO also documented its MV (33 kV) standards, focusing on system configuration, computer-aided design (CAD) drawings and materials lists for system components. Its aim was to design a unit configuration cataloguing system that integrates and tracks the location of warehoused supplies, system components and design specifications to assist construction crews, planning engineers and warehouse stock keepers to easily access information and location of materials. By designing its systems to specified standards, Jordan's distribution utilities are able to seamlessly interconnect to one another and strengthen network reliability.

3.4.8 Jordan: At the urging of the SMUD, EDCO reconfigured its distribution system to include 3.3 kV distribution lines in an effort to move away from its

lengthy low voltage 0.4 kV service lines. It also replaced and updated transformers, capacitors, conductors and switching equipment. EDCO adopted numerous maintenance best practices such as:

- Scheduling preventative and reliability-centered maintenance
- Developing a long-term plan to convert the existing distribution system to MV
- Conducting live line maintenance to reduce customer outages, with an increased focus on worker safety.

3.4.9 Jordan: Prior to the beginning of the partnership with APS, NEPCO had commenced construction on its new National Control Center to operate the transmission system and dispatch power flows. NEPCO modified its control center blue prints to incorporate design elements found at APS's control center. They also adopted APS's control center desk layout in order to maximize dispatcher productivity and software system operability. Since these changes were implemented, NEPCO dispatchers have been able to better manage power flows on the transmission grid and ensure greater reliability and network stability.

3.4.10 GtG/India: USEA organized a series of system operations peer reviews, including of the Karnataka and Gujarat state load dispatch centers in India. The peer reviews were conducted by Mr. Bob Staton, Manager of an Xcel Energy control center near Denver, Colorado, and Mr. Mark Edstrom, Management Consultant in Energy Sector, Partner at EHA+Company, who provides consulting on large infrastructure projects and organizational change initiatives for major electrical utilities. Following feedback from the dispatch centers who participated in the FY 2015 peer reviews, written reports were provided for this round of peer reviews with a summary of their observations and recommendations for improvements. After the peer review by U.S. experts, the Gujarat SLDC followed their recommendations and made several changes, including:

- implemented security recommendations including a security plan and video monitoring
- completed an internal assessment
- added 2500 square meters of space to the dispatch center (construction complete in mid-2019)
- added redundancy by shifting an existing server to the new REMC building for separation and redundancy/system security
- shifted operations to the backup center in Gandhinagar for several days to test the redundancy of the system and will regularly schedule such tests from now. These tests will ensure the backup center is fully capable of handling the system in case of emergency, thus ensuring reliability in emergency situations.
- arranged more training sessions on a dispatcher training simulator (DTS) for grid operators. This training will improve dispatchers' ability to quickly respond to issues on the system and handle fluctuations from intermittent resources that are continuously being added to the system.

3.5 INCREASING STAFF CAPABILITY TO IMPROVE OPERATIONS AND DECREASE NEED FOR FUTURE ASSISTANCE

The strategic importance of building capabilities is apparent around the globe. As the global population continues to grow so also do the requirements to meet energy demands. As utilities are growing to meet ever increasing demands, they often face notable capability gaps as they expand. Customer demand and strategic importance are driving the need for increased capabilities from the frontline workers to the executive levels.

Capacity building was an important factor in all of the work undertaken through EUPP. The executive exchanges, trainings, sponsorship of delegates to relevant energy sector conferences, were all geared towards increasing the capacity of the utility staff to run more efficient operations so that more affordable and reliable energy sources were available to their customers. Some of the key accomplishments and success in this area included.

- 3.5.1 Nigeria:** USEA increased local capacity through our Train-the-Trainer (ToT) Meter Installation & Best Practices for NAPTIN in Nigeria. After 10 days of intensive training by Meralco Power, workshop, hands-on demo, case studies and exams, 25 NAPTIN trainers passed the final assessment after fully meeting MPA's expectation and requirements to be considered as utility metering system engineers/trainers. In addition, USAID Power Africa donated the electric meters and MPA donated the metering supplies to NAPTIN for future training courses.
- 3.5.2 Senegal:** After two intensive hands on dispatch trainings for the dispatch and planning departments, 12 dispatch operators enhanced their knowledge and ability to effectively dispatch power across their system. This is vital as Senegal is aggressively introducing both solar and wind projects into their grid to reduce their reliance on heavy diesel and this training will assist the staff to effectively handle the intermittency of renewables.
- 3.5.3 Tanzania:** As the request of the Ministry and Mines, USEA assisted TANESCO, MME, and other government entities, to update a flowchart outlining the steps, timeline, and defined roles and responsibilities for holding RPAs in Tanzania. Stakeholders in Tanzania used the flowchart to help them design the country's first RPA and in 2018, TANESCO issued a notice of an upcoming tender for solar, wind, and advanced coal-fired generation projects.
- 3.5.4 Kazakhstan:** Prior to the USEA workshop in Astana on October 24-25, 2016, stakeholders in Kazakhstan did not know much about auctions or how they worked. USEA brought volunteers from Mexico and Brazil to discuss how auctions were developed in their countries and share their experiences with the process. During this workshop, participants developed a roadmap and framework for steps that the Kazakhstani government took to implement renewable energy auctions in Kazakhstan. As a direct result of our workshop, the Ministry of Energy of the Republic of Kazakhstan released an order on the approval of rules of organizing and holding auctions on December 21, 2017. In March 2018 a tender was announced for the first auction. Upon reviewing the tender announcement, USEA notes that Kazakhstan has allotted a maximum

MW for each technology – 290 MW solar, 620 MW wind, 75 MW hydroelectric and 15 MW biomass. The concept of allocating based on technology was another topic of discussion at the October 2016 workshop.

3.5.5 East Africa Geothermal Partnership (EAGP): EAGP facilitated a one-week, in-country technical assessment of ODDEG's current data systems, practices and equipment for collecting, processing, storing and sharing geothermal data. One U.S. industry expert, along with EAGP staff, carried out the detailed assessment of ODDEG's data management practices in August 2016. The assessment consisted of meetings and interviews with ODDEG's departments that relate to resource exploration, management, drilling, and associated infrastructure and logistics work as well as staff members from the Ministry of Energy and Natural Resources (MERN) and the Centre d'Etudes et de Recherche de Djibouti (CERD) who also work in geothermal. Improved data availability and quality will promote increased private sector participation in the tendering and PPA processes for Djiboutian geothermal prospects in the future.

3.5.6 U.S. – East Africa Geothermal Partnership (EAGP): EAGP participated in the AUC's East Africa Regional Geothermal Meeting in Addis Ababa, held to launch the application process for the 4th round of the GRMF. GRMF is a donor-funded facility that provides grants to public and private developers of geothermal prospects for either surface studies or exploration drilling. EAGP provided assistance to the GSE and EEP in preparing an application for GRMF funding in the 4th round. EAGP geothermal developed an Expression of Interest (EOI) to be submitted to GRMF, in partnership with EEP and GSE. The consultant team developed and submitted the EOI to GRMF in August of 2016.

3.5.7 East Africa Geothermal Partnership (EAGP): A one-week, in-country technical assessment of the GDC current data systems, practices and equipment for collecting, processing, storing and sharing geothermal data was held by the EAGP. Two U.S. industry experts carried out the detailed assessment of GDC's database and data management systems. The assessment consisted of meetings and interviews with GDC's departments that relate to resource exploration, management, drilling, and associated infrastructure and logistics work. Based on information obtained during the in-country portion of the assessment, the consultants produced a detailed report that included recommendations for system improvements (technical and business structural) that improve the quality of and access to geothermal resource data, expected costs, a guide to execute the suggested actions for improvement, and a roadmap for subsequent stages of technical assistance that will concretely improve GDC's data management system. The **GDC Technical Assessment** is included with this report in **Annex D**

3.5.8 East Africa Geothermal Partnership (EAGP): EAGP, under the Power Africa Initiative, facilitated a short-term technical assistance program for Kenya's GDC and MoF with respect to key provisions in geothermal SSAs. Through the assistance of a consultant, discussions were held with key individuals at GDC, MoF, and the KPLC regarding key financial clauses in SSAs and to define potential next steps each of these entities can take to reduce risk with respect to commissioning geothermal plants.

- 3.5.9 East Africa Geothermal Partnership (EAGP):** EAGP facilitated a short-term technical assistance program for Kenya’s GDC on producing a joint development agreement for PPPs in geothermal development. Consultants met with key individuals at GDC and MoF regarding legal structures, financially viable project structures for PPPs and developed a set of recommendations for GDC and produced a market assessment of GDC’s proposed joint development structures and presented the results to GDC for consideration.
- 3.5.10 East Africa Geothermal Partnership (EAGP):** EAGP carried out a two-prong program with Lawrence Berkley National Labs (LBNL) and 14 KenGen reservoir scientists and geoscientists for training in the state of the art TOUGH reservoir modeling software. The software has been used to update and refine the Olkaria Geothermal Reservoir, allowing KenGen to more accurately target new wells in addition to ensuring long term stability of the subsurface resource. Lifetime, company-wide licenses for TOUGH were given to KenGen by EAGP and LBNL.
- 3.5.11 East Africa Geothermal Partnership (EAGP):** The EAGP team worked alongside the GSE and EEP to prepare and deliver a successful application for the 4th round of GRMF financing. The application process has completed two stages, an EoI and full application stage after which the proposal prepared by GSE, EEP, and a USEA-supported team was selected for award. GRMF facility managers provided 21 terms to the GSE and EEP team in order to comply and receive the grant award.
- 3.5.12 Jordan:** Recognizing the need for trained line workers to build the next generation of Jordan’s distribution system, IDECO developed a pre-apprentice pilot program for incoming line workers. Established with Jordan’s Ministry of Labor and modeled after certain aspects of SMUD’s pre-apprentice training program, this pilot engaged 15 future line workers for four semesters of classroom theory, field observation, on-the job training and training center practice. Motivated by their experience with SMUD, IDECO partnered with the Hakema Vocational Training Center, a government facility, to build Jordan’s only distribution pole training yard. This training program is also intended to train Jordan’s technical line workers on state-of-the-art maintenance techniques, especially live line maintenance that will herald a new era of efficient, reliable and safe distribution operations.
- 3.5.13 Jordan:** IDECO modernized its training programs, mandating a training needs assessment for all employees, including new hires. Evaluations of training programs are completed by both instructors and trainees. IDECO instituted a yearly training plan with tailored courses for various levels of staff on safety, technical and non-technical subjects. In addition, IDECO has increased its minimum safety standards, updated safety manuals and provided training courses on these updates. Such courses include first aid, cardiopulmonary resuscitation (CPR), line worker emergency training and weather preparedness.

3.6 RESTRUCTURING AND GOVERNANCE

The electricity sector is becoming increasingly critical, given its importance for our digital economies. The power sector is expected to see the most rapid growth of any energy subsector, driven by electrification in the developing countries.

Technological changes are radically altering the nature of the electricity sector in all four phases: generation, transmission, distribution, and end use—and these changes are forcing adoption of new policy, regulatory, institutional, and operating models.

To this end, EUPP facilitated restructuring and governance activities in select countries focused on some of the common elements of electricity reform that are found in the table below.

Common Elements of Electricity Reform:	
Policy Dimension:	Key features:
Restructuring:	<ul style="list-style-type: none"> • Install private management (common in Africa) • Vertical and/or horizontal unbundling • Separate profitable parts for sale to private investors
Financial Viability:	<ul style="list-style-type: none"> • Cost recovery in pricing • Reduce or eliminate subsidies • Enforcement of collections
Regulator:	<ul style="list-style-type: none"> • Remove regulatory function from ministry • Create independent regulator • Legally define scope, authority, methods • Create tariffs and pricing for utilities
Independent power producers:	<ul style="list-style-type: none"> • Allow non-utilities to generate power • Power purchase agreements
Privatization:	<ul style="list-style-type: none"> • Outright sale • Stock sale • Joint venture • Partial privatization
Competitive markets:	<ul style="list-style-type: none"> • Single buyer • Bilateral forward contracts • Cost-based pool • Bid-based pool

Some of the key accomplishments and successes in this area included:

- 3.6.1 Jordan:** In 2010, NEPCO consolidated its nine main departments into four and appointed the five remaining Assistant Managing Directors to a new strategic planning and governance committee. Using communications strategies on change management learned from its partnership with APS, NEPCO tried to gain acceptance from its employees on the restructuring process as they planned the restructuring of each department. NEPCO executives also reviewed APS’s corporate structure and considered adapting its governance by-laws. By 2012, NEPCO had successfully managed the restructuring of its human

resources department. APS supported NEPCO's efforts and gave critical feedback that reinforced the decisions by NEPCO's senior management.

- 3.6.2 Jordan:** JEPSCO and IDECO restructured their human resources departments and cited information from SMUD, especially on recruitment and training, as being very helpful. In addition, based on their experience with SMUD, EDCO and IDECO made significant changes to their employee evaluation and compensation policies, which provide employees with performance incentives, regular (monthly or quarterly) evaluations and updated, uniform job descriptions. Both utilities have also linked employee performance to salary increases and bonuses and have implemented new performance appraisal forms to institute these policy changes. Furthermore, IDECO has linked individual performance metrics to department level key performance indicators (KPIs) to measure how each individual employee contributes to the utility's strategic goals. By benchmarking employee performance against the utility's Key Performance Indicators (KPIs), IDECO hopes to identify additional initiatives to streamline workflow and enhance its overall operational efficiency.
- 3.6.3 Jordan:** IDECO, EDCO, and JEPSCO created several new departments and committees to address energy efficiency and regulation. As a result of the first executive exchange to SMUD in May 2009, the distribution utilities created a joint Key Operational Plan (KOP) task force to find opportunities in energy efficiency. This task force met several times and eventually led to the creation of an energy efficiency department at IDECO.
- 3.6.4 Jordan:** IDECO and DCO created regulatory affairs departments within their organizations to improve relations with the regulatory body, ERC, and work on tariff cases and other cases brought before the ERC.

4. LESSONS LEARNED

4.1 STAKEHOLDER BUY-IN IS CRITICAL FOR PROGRAM EXECUTION:

It is essential to take the time and effort to meet with stakeholders and to come to mutually agreed upon goals and priorities. USEA made it a priority under EUPP to conduct scoping missions and to liaise with all relevant stakeholders and seek their input for EUPP's initiatives. However, in some cases, the USAID mission's goals were not completely in-line with the local partners'. This disconnect meant the utility did not put resources toward making the necessary changes highlighted during EUPP activities as other issues were a higher priority. In these cases, it is very difficult to have a successful outcome on capacity building activities or technical assistance projects.

4.2 STABILITY OF LEADERSHIP DURING PROGRAM IMPLEMENTATION GREATLY INFLUENCES PROGRAM OUTCOMES:

Consistency in leadership was an important predictor of a program's success. Leadership shifts in Tanzania and Haiti slowed the partnerships' progress, and actually stopped delayed programs activities for years in the case of Haiti. However, in countries that maintained the same leadership over an extended period of time, partnerships had the opportunity to be executed from start to finish and incite positive change.

4.3 CEO RECEPTIVITY TO CHANGE IS KEY TO THE WILLINGNESS OF MANAGING DIRECTORS AND TOP MANAGEMENT AT THE UTILITIES TO IMPLEMENT NEW IDEAS:

Management's mindset is a critical factor in change facilitation, otherwise known as change management. Utilities with more progressive leadership adopted best practices more readily than those with more traditional views. When there was buy-in from top leadership, they utility staff were willing and wanted eager to make the changes suggested.

4.4 THERE MUST BE AN ADEQUATE AND PRIORITY ALIGNED UTILITY BUDGET:

When the utilities have the money in their budget to make the recommended changes, program success is more likely. If a utility is already working on or has aligned priorities with money to pay for the changes, EUPP is more likely to realize its results.

4.5 THERE MUST BE CLEAR UTILITY WORK PLAN OBJECTIVES THAT CONTINUE FOR MORE THAN A YEAR:

When a partnership's priorities are changing shifting, it is more challenging to realize concrete results. S, several partnerships had multiple and divergent objectives over a 2-3 year time period, making it difficult to have execute multiple, progressing activities on a single topic that could lead to tangible results. Constantly changing shifting focus led to activities that were only introductory in nature and prevented USEA from going in depth on topics to achieve results.

4.6 MORE THAN THREE ACTIVITIES SHOULD BE DEVELOPED FOR ANY SELECTED TOPIC:

When there were multiple activities developed around a stakeholder priority area, where each activity built on the previous one and delved deeper into the topic each time, results were more likely.

4.7 CONTINUITY OF ACTIVITY PARTICIPANTS IS CRITICAL:

When delving deeper into a topic, it is critical to have the same participants involved in the series of trainings to ensure that the knowledge building is taking place. This is very important when the subject matter involves leadership training and succession planning as those individuals will be responsible for the development of future staff and corporate ideologies.

4.8 COORDINATION WITH OTHER IN-COUNTRY PARTNERS REDUCES DUPLICATION AND STREAMLINES RESULTS:

It is necessary to coordinate with other in-country USAID partners to reduce duplication of efforts and to streamline results and leverage funding opportunities.

4.9 EXPECTED RESULTS SHOULD BE PRIORITIZED INTO SHORT-TERM AND LONG-TERM:

When funding is limited, short-term goals should be prioritized while also identifying the long-term goals. Ideally, the short term goals should be a part of the bigger, long term goals. The is also the understanding that as each countries priorities change so will some of the short-term and long-term goals. This should be identified and in the partnership work plan and the scheduling of activities.

4.10 ON-SITE INTERVIEWS SHOULD BE CONSIDERED FOR RESULTS REPORTING:

Tracking results from capacity building programs is very labor intensive. Normal methods, such as surveys, are ineffective due to poor response. It is likely that the best way to identify results

from capacity building programs, is to do on-site interviews with the key staff and organizations throughout the partnership and then every year or so after the conclusion of the activity.

4.11 COLLABORATION WITH OTHER DONOR AGENCIES IS KEY TO THE EFFECTIVENESS OF EUPP:

Increased collaboration with other donor agencies increases the effectiveness of programs and decreases the likelihood for duplication of efforts.

4.12 PARTICIPANT NOMINATIONS MUST BE MORE FOCUSED AND COMMUNICATED:

The background requirements for program participant nominations should be as specific as possible. The requests should outline the level of experience, years of experience in the sector, responsibilities held by the participants, and gender. The more specific the background requirements, the more likely it is that the program will be attended by executives who will benefit from programming the most.

4.13 LOCATION OF PROGRAM ACTIVITIES IS A FACTOR THAT MUST BE CONSIDERED:

Activities held in the U.S. and Europe are more likely to include participants who were nominated based on seniority rather than experience/job. Also, activities conducted in-country allow for a greater number of participants, but consistent participation may be negatively impacted due to executives choosing to visit their offices and skip some of the training.

4.14 SUBCONTRACTING WITH RELEVANT SECTOR EXPERTS IS KEY FOR THOSE USAID-ASSISTED COUNTRIES WHO HAVE MORE MATURE ELECTRIC POWER SECTORS:

While the thrust of EUPP was based on including experts who volunteer their time and effort, some topics required a paid consultant who would, because they were being paid, be contractually obligated to provide the quality of deliverables required by the recipient country. This has become more necessary as the USAID-assisted country's electric power sectors are maturing and require more targeted technical assistance.

4.15 SCHEDULING OF PROGRAM ACTIVITIES NEEDS TO TAKE PLACE AT THE ONSET OF EUPP:

The recipient country utility should be given very clear roles and responsibilities and deadlines to ensure they understand their role and contribute to the success of the partnership. Specifically, assistance they will need to provide and targets for results and deliverables should be mutually agreed upon in advance.

4.16 CLEAR USAID-ASSISTED COUNTRY UTILITY RESPONSIBILITIES NEED TO BE COMMUNICATED:

The recipient country utility should be given very clear roles and responsibilities to ensure they understand their role and contribute to the success of EUPP. Specifically, assistance they will need to provide and targets for results and deliverables should be mutually agreed upon in advance.

4.17 INVOLVEMENT OF POLICY MAKERS IS CRITICAL:

Roadblocks to results are often experienced because the policy makers and regulators are not familiar with the topic. It is critical to engage the utilities along with their policy makers and regulators to ensure that all interested parties receive the same information and have a similar understanding of the issues. As an example, the regulator in Jordan did not feel utilities should be running energy efficiency programs, which stymied our efforts to teach the utilities how to design and implement them.

4.18 PRIVATE UTILITIES ARE FASTER AT ENACTING CHANGE:

Private utilities seemed to be able to act more quickly in part due to management structure and the internal approval process.

4.19 FUNDING IS CRITICAL TO THE ADOPTION OF BEST PRACTICES LEARNED THROUGH PARTNERSHIP ACTIVITIES:

Both transmission and distribution utilities are often unable to collect adequate funds through current electricity tariffs to support their operational and capital needs. This lack of funding is often a major impediment to the implementation of new best practices, and in particular to making needed utility improvements and instituting needed training programs.

4.20 TRAINING BUDGETS NEED TO BE INCREASED:

Training budgets at all utilities need to be increased to allow the utilities to move toward more modern practices and systems. Improved training is greatly needed for capacity building at the operational level covering such issues as hot line maintenance, Geographic Information System (GIS), and other operating systems and dispatch.

5. SUMMARY OF PRODUCTS, PRESENTATIONS, AND PUBLICATIONS

Articles, publications, and presentations produced in conjunction with EUPP can be found on the EUPP webpage at: <https://www.usea.org/program/energy-utility-partnership-program-eupp>

We provide copies of **Selected Publications** with this report as **Annex D**.

5.1 Selected Publications, Presentations, and Publications

- **Data Management Assessment Report for Kenya’s GDC**, Stephen M. Richard, U.S. Geoscience Information Network and Richard E. Zehner, Geothermal Development Associates, 2015. By invitation from the GDC management Mr. Richard and Mr. Zehner were invited back to reassess and update their understanding of the current state of GDC’s geothermal data management. This report updates the information in the first report that was published in 2014.
- **South Asia Regional Initiative for Energy Integration (SARIEI) Report on “Linking South Asia with Burma & Southeast Asia to Advance Cross Border Electricity Trade: A Political Economy Study”**:
- **EKT Wheeling Report**:
- **John Beardsworth Report, “Tariff Calculation of the Ethiopia – Kenya – Tanzania Transaction”**:
- **Ethiopia Law Report**:
- **Haiti “Final Report on Capacity Building Workshop Series for the Haitian Regulatory Agency”**:

ANNEX A:

Selected Activity Agendas

ANNEX B:

Jordan Utility Partnership Program Final Report

*Copy of Jordan Utility Partnership Program Final Report has
been submitted as a separate file*

ANNEX C:

Impact and Indicator Tables

*Impact and Indicator tables have been submitted
separately as Excel Files*

ANNEX D:

Selected Publications